For CONTENTS, see pages iii and iv of Cover.

pp. 477—535.] [March 15, 1913.

TROPICAL DISEASES BULLETIN

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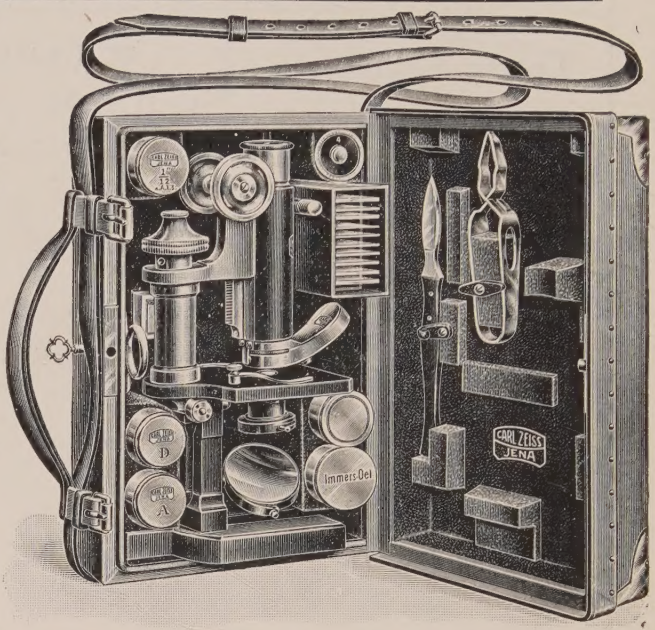

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TROPICAL DISEASES BUREAU.

TROPICAL DISEASES BULLETIN.

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BERIBERI.

Laboratory and Experimental.

Strong (Richard P.) & Crowell (B. C.). **The Etiology of Beriberi.**—*Philippine Jl. of Science.* Sec. B. [*Philippine Jl. of Trop. Med.*]. 1912. Aug. Vol. 7. No. 4. pp. 271-411. With 7 plates.

In this most interesting and valuable paper the authors give a short and reasoned summary of the experiments and theories that have been put forward relating to the etiology of beriberi. It is pointed out that most of the experimental work has been carried out with birds, particularly that bearing on the production of neuritis and paralysis. The opinion of most observers is that though polyneuritis gallinarum is closely allied to beriberi in man we are not justified in saying that they are the same disease or due to the same causes. The authors therefore set themselves to show, if possible, by definitely planned and carefully carried out experiments *on man* whether beriberi, as it occurs in the Philippines, is an infectious disease or whether it is one which has its origin in disturbances of metabolism brought about by the prolonged use of polished rice as a staple diet. The experiments were carried out in the Bilibid prison where the hygienic conditions were almost ideal. The subjects of the experiment were prisoners under death sentences, in perfect health, quite free from any beriberi taint, who were entirely isolated. The reasons and dangers of the experiments were explained to the prisoners and twenty-nine volunteered. These were divided into four groups, three of the groups being allowed to mix freely with each other, except at meal times, the fourth group being absolutely isolated. A full account of the dietary and course of each case and group of cases is given.

In group (1) six cases received white rice with rice polishings for 13 days, and alcoholic extract of rice polishings for about 80 days (the men refused to eat the rice polishings after 13 days). Of these six cases two contracted symptoms of mild beriberi; four remained quite free.

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In group (2) six cases received white rice only, with other diet common to all groups, for about 100 days; of these, four contracted true beriberi, the other two showing early signs.

In group (3) white rice plus rice polishings was given for 17 days, followed by red rice for about 100 days; of this group one out of six developed rather marked symptoms suggesting beriberi.

In group (4), on white rice and the common diet, out of eleven cases four developed severe beriberi, one acute case died, and there were also two mild cases and one doubtful case. All the groups had in addition a diet of which details are given.

In none of the cases was a complete picture of beriberi obtained except those in which white polished rice formed the staple article of diet, but in one case fed on red rice the diagnosis of beriberi was made. In group (1), each member of which received 40 c.c. of unheated alcoholic extract of rice polishing (equivalent to 320 gm. of rice polishing), two cases showed symptoms of beriberi, suggesting that, whatever may be the result obtained with this extract in preventing polyneuritis in fowls and in curing the condition after it has developed, for the prevention of beriberi in adult man or for the treatment of the disease some other substances, as mongo beans and yeast, are far superior and are much easier to obtain.

The fact that four out of the six subjects of group (1) remained absolutely free from the disease shows that the extract has a preventive action; the essential ingredient is, however, only present in very small quantities, as has been shown by Funk and Cooper. A loss of weight was present in practically all the subjects experimented on, but was generally most marked in those showing beriberi symptoms. Out of the seventeen fed on white rice as the staple diet (groups (2) and (4)), eight developed beriberi, the symptoms appearing from 61 to 75 days from the commencement of the feeding.

The authors conclude that in their experiment beriberi was produced only by means of the diet, developing owing to the absence of some substance or substances necessary for the normal physiological processes of the body, and that these substances are present in red rice, rice polishings and in small amount in alcoholic extracts of rice polishings. In some instances even when these substances are present, if there is very little variety and very few articles of food are given, and the assimilative functions of the patient are poor, symptoms of the disease may come on, such symptoms being easily dispersed by improvement in the diet. The experiments proved that the disease was not an infectious one, as groups (1), (2), and (3) mixed freely together, yet there was no tendency for the disease to spread in groups (1) and (3)—neither could it have been due to infection of the food itself. The limit of 0·4 per cent. of P_2O_5, which Fraser and Stanton have repeatedly suggested as the legal minimum for saleable rice, is believed by the authors to be too low, as cases occurred in their experiments with rice having a P_2O_5 content of ·37 per cent. If the legal limit were fixed at 0·4 per cent. P_2O_5, it would not give a sufficient margin for safety.

P. W. Bassett-Smith.

VEDDER (E. B.). **A Fourth Contribution to the Etiology of Beriberi.** —*Philippine Jl. of Science.* Sec. B. [*Philippine Jl. of Trop. Med.*]. 1912. Aug. Vol. 7. No. 4. pp. 415-422.

In this paper the author describes a large number of fresh feeding experiments on fowls, carried out to determine the actual character of the neuritis preventing substance known to be present in rice polishings. His experiments prove that the neuritis preventing substance is a most delicate compound and that chemical manipulations with it must be most carefully carried out if it is to remain uninjured. From an experiment on fowls fed upon a carefully prepared and mixed diet he concludes that polyneuritis gallinarum does not result because of any deficiency in the ordinary food elements; and assuming that beriberi in man is a similar disease, it is apparent that beriberi may develop in men who are receiving what is supposed to be a balanced ration, provided that none of the components of that ration contain the neuritis preventing principle. Though the experiments all gave negative results, they are important to record as each additional one confirms the belief that there is a definite substance capable of preventing polyneuritis in fowls, and as each element is excluded by experiment the task of identification is simplified.

The following conclusions are given:—Neuritis in fowls is not produced by alcohol and is therefore not caused by fermentation of starches; it can develop when the diet contains a sufficiency of all the alimentary principles, provided no one of the ingredients contains the neuritis preventing substance. The neuritis preventing body is non-volatile, is destroyed by heat, is not an organic salt, fat, or proteid, and as it cannot be extracted with ether is probably not an alkaloid. It is probably an organic base as claimed by FUNK, though Vedder's experiments did not actually confirm his work.

[COOPER has extracted the anti-neuritic substance from egg yolk by both alcohol and ether.].

P. W. B.-S.

SCHAUMANN (H.). **Zu dem Problem der Beriberiätiologie.** [The Etiology of Beriberi.]—*Arch. f. Schiffs-u. Trop.-Hyg.* 1912. Dec. Vol. 16. No. 24. pp. 825-838.

The author states that recent research all points to the truth of the assumption that beriberi is a disease due to defective metabolic processes. In his earlier experiments certain nitrogenous bases were shown to have an important influence on the production and cure of the disease; he now suggests that perhaps other, as yet undiscovered substances, may have an important influence. FUNK was the first to obtain the nitrogenous base, which he called vitamine, in sufficient quantity to use experimentally on pigeons and also to analyse it. Schaumann thinks that though the injection of ·02 – ·04 gm. of vitamine into polyneuritic birds succeeded in curing them in a short space of time, the experiment does not prove that the vitamine was the *only* active healing principle. The author vigorously repudiates the suggestion of FUNK that he (Schaumann) borrowed the phosphorus theory from FRASER and STANTON. He is of opinion that researches up to the

present have failed to establish the fact that an effective therapeutic and prophylactic agent can be obtained by means of hydrolysis of nucleic acid, and contradicts the statement of FUNK to the effect that phosphoric acid is contained in relatively large quantities in polished rice.

In some experiments on healthy and polyneuritic pigeons FUNK found a decrease of lipoids in the brains of the latter; the author however states that only the phosphatides and *not* all the lipoids were decreased (phosphatides Schaumann describes as phosphorus-containing lipoids).

The experiments of both show a decrease in the phosphorus content in the brains of polyneuritic pigeons and the experiments of FUNK show no decrease in the phosphorus content of starved pigeons. Schaumann therefore concludes that a decrease in phosphatides in diseased polyneuritic birds is an established fact. He also states that a bird showing polyneuritic symptoms may be cured within 24 hours by a paste made of calcium silicate and the brain of a healthy bird fed upon peas; also the injection of healthy bird serum into the breast muscles of a diseased bird will improve the condition of the paralysed subject. FUNK has misunderstood the author to say that vitamine acts as a hormone; his real meaning was that vitamine may give rise to the formation of a hormone, and that probably all vitamines act as katalysators. WIELAND'S experiments on mice are not considered to be reliable. The work of SCHÜFFNER and KUENEN on the etiology of beriberi demonstrated that rice-eating nations excrete in the urine about half the amount of P_2O_5 that Europeans excrete. Beriberi patients show a still smaller excretion (0·13 gm.) which gradually increases as they progress towards convalesence; in very severe cases the phosphorus excretion remains low even after appropriate dietary changes, suggesting that it is retained.

The author states that the effect produced by the vitamines on the metabolic processes has still to be determined, as also the composition of the therapeutically active phosphorus compounds. In his opinion ship beriberi is due to a deficiency of phosphorus compounds in the diet. An alcoholic extract of yolk of egg, wheat, milk, and calves brain, soluble in ether, was found to have a prophylactic effect on mice. This is remarkable as most vitamines are insoluble in ether and shows that there may be other therapeutically and prophylactically active principles besides vitamines.

In conclusion the author says that all these seemingly contradictory results point to the fact that many questions have still to be cleared up, (1) whether we have to do with a collective effect of several related substances, and (2) whether the phosphorus metabolism is an important factor in the production of beriberi or not.

P. W. B-S.

COOPER (E. A.). **On the Protective and Curative Properties of certain Foodstuffs against Polyneuritis Induced in Birds by a Diet of Polished Rice.**—*Jl. of Hygiene.* 1912. Dec. Vol. 12. No. 4. pp. 436-462.

The author first gives a short historical account of the work done by various investigators from 1910, leading up to the isolation of the anti-neuritic substance obtained from rice polishings

by Funk. The present paper deals with the quantitative determination of the preventive powers of several common food-stuffs against polyneuritis, induced in birds by diets of polished rice, and the attempt to isolate the active constituent or constituents. A large number of experiments, using various foodstuffs, were carried out with pigeons, the details of each experiment being given. The foodstuffs he divides into three classes:—

(1) Food inefficient in preventing neuritis and loss of weight = polished rice and beef.

(2) Food efficient in both capacities = yeast, heart, and brain.

(3) Food efficient in preventing neuritis, but less efficient in maintaining body weight = egg yolk, barley, lentils.

The author summarises his conclusions under two headings to this effect:—

I.—On the distribution of the anti-neuritic substance amongst foodstuffs.

(1) The anti-neuritic body is most irregularly distributed amongst food-stuffs.

(2) Pigeons fed naturally on daily rations of polished rice of 1/20th the body-weight for the first two weeks and on much smaller rations subsequently, develop symptoms of polyneuritis three to four weeks after being placed on this diet, and lose from 10 to 40 per cent. in weight.

(3) Pigeons fed on daily rations of polished rice of from 1/11th to 1/30th the body weight develop symptoms of polyneuritis in a much shorter time (in about 14 days).

(4) As much as 20 gms. of raw beef are necessary daily to prevent polyneuritis in pigeons weighing about 350 gms.

(5) The heart muscle of the ox greatly exceeds the voluntary muscle of the same animal in its capacity for preventing polyneuritis.

(6) Sheep-brain is only about twice as efficient as beef in preventing polyneuritis.

(7) Although the addition of small amounts of brain to a diet of polished rice does not prevent polyneuritis, it is effective in almost entirely checking the loss in weight that ensues on this diet. Since birds fed exclusively on polished rice can only be maintained in body-weight by giving very large rations, it is concluded that there is a secondary deficiency in polished rice of substances essential for the maintenance of body-weight, and that these are comparatively abundant in brain.

(8) Polyneuritis is accompanied by fatty degeneration in the nervous system whether body-weight is maintained or not.

(9) The daily addition of 10 gms. of fish (hake) to the rice diet did not prevent polyneuritis and loss in weight.

(10) Egg-yolk exceeds all the other food-stuffs examined of animal origin in anti-neuritic value, three grams daily added to the rice diet being sufficient to prevent polyneuritis. Its capacity for preventing this disease is not measurably altered by boiling for four minutes.

(11) Dried lentils and unhusked barley are efficient anti-neuritic food-stuffs. Three and five grams respectively of these substances added daily to the rice diet are sufficient to prevent polyneuritis.

(12) The loss in weight induced by daily rations of polished rice equivalent to about 1/20th the body-weight can be prevented without altering the actual quantity of food given by substituting barley for polished rice to the extent of about 30 per cent. This loss in weight is therefore shewn to be due to a genuine deficiency in polished rice and is not the effect of underfeeding.

(13) One-half a gram of dried yeast daily is quite sufficient to prevent polyneuritis and also to maintain the body-weights of birds fed on polished rice.

Yeast is more efficient in preventing this disease than any of the above foodstuffs.

(14) Egg-yolk, heart-muscle, yeast, lentils and barley will be effective in the prevention of beriberi. On account of their cheapness lentils and barley will probably be the most practicable for this purpose.

(15) The relative efficiencies of the various foodstuffs in preventing polyneuritis and in maintaining the body-weights of birds fed on polished rice do not correspond. This indicates that the anti-neuritic constituent and the substances maintaining body-weight are not identical. Evidence is brought forward in the text which seems to indicate that the latter substances are not protein, fatty or lipoidal in nature.

II.—On the curative properties of extracts of various foodstuffs.

(1) Meat.—The anti-neuritic constituent is not extracted by water and only to a small extent by ether. It is readily extracted by alcohol and after this procedure, although still insoluble in ether, is easily dissolved by water.

(2) Egg-Yolk.—The curative constituent is present in a form readily extracted by both alcohol and ether. It is not however entirely removed by the latter solvent, since an alcoholic extract of egg-yolk which has been thoroughly exhausted with ether still possesses marked curative properties. These results indicate that a large portion of the anti-neuritic substances contained in meat and egg-yolk is not combined with the fats or free (ether-soluble) lipoids, but is possibly present in the *combined* lipoids, which are only extracted by alcohol.

(3) Lentils.—The constituent of lentils that cures polyneuritis is soluble in strong alcohol and in water, is not precipitated by basic lead acetate, and is almost entirely precipitated by ammonium molybdate. There is evidence that the active substance disappears in large quantities during the latter fractionation. It is possibly destroyed by contact with alkali.

Strychnine.—Strychnine does not cure polyneuritis but prolongs the lives of pigeons affected with this disease.

P. W. B.-S.

Funk (Casimir). **The Nitrogenous Constituents of Lime-Juice.**—*Biochemical Jl.* 1913. Jan. Vol. 7. No. 1. pp. 81-86.

In this paper a description is given of some experiments carried out by the author to determine the nitrogenous constituents of lime juice. 407 litres of commercial lime juice, in portions of 15 litres each, were precipitated with 2,800 gm. of neutral lead acetate. The precipitate was freed from lead, and concentrated in vacuo at a low temperature. During distillation crystals were separated out, which when filtered off weighed 258 gm., and were finally obtained in fine needles. The substance of which the crystals are formed belongs to the terpene group and has probably no direct relation to the scurvy problem. From the filtrate a 5 per cent. sulphuric acid solution was made, and then a 50 per cent. phosphotungstic acid solution was added until precipitation was complete. From this precipitate were obtained (1) Substances of the purine group, (2) Substances of pyrimidine base, (3) Substances of the choline group.

A chemical analysis was made of these three groups and is described; from the latter a final product of yellow needle-like crystals was obtained, similar in its formula and properties to a substance described by v. Braun (1908) as platinichloride of methylpiperidylacetic betaine. Further investigations are being made.

P. W. B.-S.

FUNK (C.). **Further Experimental Studies on Beriberi. The Action of certain Purine- and Pyrimidine-Derivatives.**—*Jl. of Physiology.* 1913. Feb. Vol. 45. No. 6. pp. 489-492.

In earlier papers the author was able to show that a substance may be isolated from rice-polishings, yeast, milk and bran, which has a curative effect on birds suffering from polyneuritis, the chemical properties of which suggested that it belonged to the pyrimidine group.

Attempts to simplify the method of extracting this substance were not successful, but a substance named allantoin was obtained which was found not to cure neuritic birds, but to retard their death for several days.

The experiments described in this paper show that a number of purine and pyrimidine substances possess a very marked action on neuritic birds, being able to replace some of the physiological functions of beriberi-vitamine, also that pigeons are not able to convert uric acid into allantoin. Further experiments are being carried out.

P. W. B.-S.

GLOGNER (Max). **Die Nahrungsmitteltheorien über die Ursache der Beriberi in kritischer Beleuchtung.** [The Food Theories of the Cause of Beriberi.] 56 pp. 8vo. 1912. Leipzig: J. A. Barth.

In a monograph of 56 pages the author has set out very fully the points for and against deficiency or changes in the food supply being the cause of beriberi. From a very long experience in the Dutch East Indies he has convinced himself that polished rice or other changes in food are not the cause. At the outset he states: "No observer has yet been able to demonstrate the presence of a definite poisonous substance, or the absence of definite dietary constituents as the cause of that form of polyneuritis which can be produced in animals." [It is evident that the author has not yet seen the late work of FUNK, SCHAUMANN, and others.]

He considers that experiments on animals are not analogous to what occurs in man, and that denaturalising the food by cooking at a high temperature probably produces poisonous albuminous substances, which exert a direct toxic effect upon the animals under observation. He states that rice pericarp is useless as a prophylactic, and that the Dutch East Indian Government no longer insists on its use. He does not consider that the amount of P_2O_5 is of any importance, but is inclined to admit that there is a possibility of the presence of a substance called by SCHAUMANN "Activator" which may be of use; though this greatly discounts the P_2O_5 theory. The germ theory and deficiency theory are, according to him, impossible; his own view being that beriberi is a multiple neuritis occurring as a sequela of other diseases, notably malaria. Finally he agrees with neither EIJKMANN, FRASER, nor SCHAUMANN, and is most particularly opposed to the latter.

P. W. B.-S.

Epidemiology.

Lovelace (Carl). **The Etiology of Beriberi.**—*Jl. Amer. Med. Assoc.* 1912. Dec. 14. Vol. 59. No. 24. pp. 2134-2137.

The author gives a description of a form of peripheral neuritis met with during the construction of the Madeira-Mamoré railway in the states of Amazonas and Matto Grosso, Brazil. The disease was at first believed to be a sequela of malaria, but is now recognised as a form of beriberi; among the 30,430 admissions to hospital in four years 963 cases were diagnosed as this form of polyneuritis. It affected the better classes as well as the coolie labourer, was most frequent in the second half of the year, and showed marked evidences of frequency in certain houses. In a period of five months in 1909-1910 three men employed as night watchmen in the hospital died of beriberi, a fourth was invalided home, while a considerable number of orderlies, one of the cooks, two of the nurses, and two of the hospital physicians were attacked. The rate of incidence in the tug boats on the river also was very high. A good and varied diet, rich in meat, had been supplied to all these cases, rice either being absent or only forming a small part of the ration. The elimination of rice from the diet of the employees did not lessen the incidence of the disease. Clinically the cases were divided into *A. Acute*—(1) Those in which cardio-vascular symptoms predominated, including the pernicious forms characterised by anasarca, rapidly developing dyspnoea, cyanosis, and death. (2) Those who had paralysis of various groups of muscles, with pain and tenderness along the nerve trunks, showing the characteristic features of multiple peripheral neuritis. *B. Chronic*—The patient generally walked into the hospital complaining of swelling of the legs and soreness of the calves, and had a rapid pulse; the knee jerks were usually exaggerated, but frequently lost, and there were areas of hyperaesthesia and anaesthesia. Fully three-fourths of the cases presented these symptoms only. The mortality was 15·6 per cent. The pathological lesions were not characteristic—wasting of muscles, serous effusions, right-sided cardiac dilatation, and congestion or malarial changes of spleen and liver were found. The nerve changes were not investigated. The following conclusions are given:—

"(1) A fatal form of peripheral neuritis occurs among residents of the Madeira Valley, and among the employees of the Madeira-Mamoré railway. This neuritis must be classified as beriberi, or as a member of an, as yet, hypothetical beriberi group.

"(2) This disease bears no intimate relation to the consumption of rice, polished or unpolished, as a staple article of diet.

"(3) This disease is not due to the absence of protein in the diet of those whom it attacks."

P. W. B.-S.

Vedder (E. B.). **The Etiology of Beriberi.** [Correspondence.]—*British Med. Jl.* 1912. Dec. 21. p. 1731.

This is a comment on a note by Browning (H. G.) in the *British Medical Journal* of July 13th, 1912 on "the Etiology of

Beriberi" reported in this *Bulletin* No. 3, p. 168. Vedder points out that the probable cause of the engine-room staff developing beriberi while the deck hands who were on the same diet remained free, was not the dampness of their quarters, but rather depended upon the more exhausting work of the former. The metabolism of the nervous tissue of the engine-room crew would be more active than in the case of the deck crew, and a much larger supply of the essential vitamine would therefore be required by the former. A diet which might contain sufficient vitamine to maintain the deck crew in health might be quite insufficient for the engine-room crew.

P. W. B.-S.

i. Creel (R. H.). **The Public Health Aspect of Beriberi.**—*New Orleans Med. & Surg. Jl.* 1912. Sept. Vol. 65. No. 3. pp. 197-206.

ii. Wellman (C.), Bass (C. C.), & Eustis (A. C.). **Investigation of Louisiana Rice with Reference to the Etiology of Beriberi.**—*Ibid.* pp. 191-196.

iii. Swan (J. M.). **Summary of the Literature on the Etiology of Beriberi.**—*Ibid.* pp. 185-190.

i. The author states that the incidence of beriberi in the confines of the continental United States has been of such infrequency that the disease does not constitute a public health problem. Cases have occurred in comparatively small sporadic outbreaks in the last twenty to thirty years, several being in State Asylums and Penitentiaries. He gives a review of the distribution of the disease in the Western and Eastern Hemispheres, and describes in more detail the prevalence of beriberi in the Philippines. The enormous mortality caused by it in Manila, 656 per 100,000 in 1910-11, was shown by Andrews to be chiefly due to infantile cases. The data obtained show that beriberi occurs chiefly among rice-eating people, that it has increased among these as machine-milled rice has taken the place of hand-milled rice, and that in Manila the mortality during the last eight years has been double that of cholera. The author gives a review of the prophylactic work that has been done; he is strongly in favour of a legal standard of P_2O_5 being fixed and enforced; and for the prevention of "ship beriberi" advises the application of laws forbidding overmilled rice in rations for the crew and necessitating a generous supply of beans or other lentils.

ii. In this paper the authors describe some work done to determine whether or not the experimental results obtained by various writers with polished rice of the Orient could also be obtained with rice grown in Louisiana. Two forms of the grain were obtained, one unpolished and a second highly polished. The results of feeding experiments on hens with these two forms were practically in accord with those obtained with oriental rice—as described by Fraser, Schaumann and others. They also found

that an exclusive diet of cane sugar produced neuritis more rapidly and completely than polished rice; if birds were fed only on pure corn starch, the same symptoms developed more slowly. The authors state that further experimental work is being carried out.

iii. The author gives a short general historical summary of the recent literature on the etiology of beriberi up to the end of 1911.

P. W. B.-S.

Smith (F.) & Hastings (A. E. F.). **Multiple Neuritis among Soldiers in Calcutta and Vicinity—an Endemic, Epidemic, Seasonal Disease resembling Beri-Beri.**—*Jl. R. Army Med. Corps.* 1913. Feb. Vol. 20. No. 2. pp. 202-205.

This is a short paper, in which attention is drawn to the fact that there has been a moderate prevalence of polyneuritis among the European troops at Calcutta in the last four years, during the autumn months when the weather is very hot and damp. From the year 1909 there were 7, 3, 10 and 6 cases annually at Calcutta, and 50 cases occurred at Lebong in the Darjeeling hills in 1911. The curious fact is noted that in 1911 the Lebong cases were sent down to Barrackpore to convalesce, and that in 1912 the disease appeared among the European troops stationed there. The dietary of the men is said to have been ample and varied. Sporadic beriberi and epidemic dropsy are known to occur among civilians and natives of Calcutta, but the authors could not find any evidence to show that rice or alcohol played any part in the causation of these beriberi-like cases among the European troops.

[Further information of the Lebong epidemic would be of interest, when possibly the cause of the epidemic might be traced].

P. W. B.-S.

McLaughlin (Allan J.). **Beriberi in Infants.**—*Jl. Trop. Med. & Hyg.* 1912. Dec. 16. Vol. 15. No. 24. pp. 370-371.

In this paper a short review is given of the work of Clark, Hirota, Andrews, Chamberlain, Vedder, and the author on the disease in children known now as infantile beriberi and recognised in the Philippines under the term "taon." The author draws attention to the conclusions arrived at by Andrews (see this *Bulletin* No. 3, p. 166-167). He emphasises the fact that the children can be cured, either by treatment of the mother while suckling the child, or by administering extracts of rice polishings direct to the child. Finally he points out the importance of reducing the amount of polished rice brought into the country, if this excessively high infant mortality in the Philippines is to be prevented. A small tax on imported white rice is recommended.

P. W. B.-S.

Chevallier (C. L.). **Report on Beri-beri at Serenli, East Africa Protectorate, December, 1911, to May, 1912.**—Report to the Secretary of State for the Colonies. Received in Colonial Office, Nov. 20, 1912.

A description of a disease closely resembling beriberi is given. The symptoms were, oedema with pitting on pressure of the outer side of the upper third of the tibia or between that bone and the fibula; pain in the thigh muscles, especially the adductors, followed by similar changes in the calf muscles; early loss of the patellar knee reflex; sudden cardiac and gastric symptoms, these being quickly followed by a fatal termination. Cases of moderate severity appeared to be rare and no typical wet or dry cases as described in the text books were seen. In the later stages marked though not complete anaesthesia of the lower limbs was present; persistent vomiting and retching nearly always set in some hours or a day or two before death. The mortality was high, 44 deaths among the 112 cases, including 25 women with three deaths.

Measures were taken to cope with the epidemic which commenced in November 1911; rice was stopped early in December and the diet was improved, a liberal ration of meat being issued. The change did not however appear to have any effect on the course of the disease, as cases occurred one, two, and three months later, the largest number with the heaviest mortality, for example, being noted at the end of February 1912.

The author concludes that it is impossible to study an epidemic like this without feeling strongly that a germ is, or has been, at work as a cause of the disease. He mentions that heat, damp and overcrowding were present, all of which he believes favoured the spread of the disease.

G. C. Low.

MALARIA.

VON EZDORF (R. H.). **Malarial Fevers—Prevalence and Geographic Distribution in Alabama.**—*U.S. Public Health Rep.* 1912. Dec. 27. Vol. 27. No. 52. pp. 2181-2189.

It is shown in this investigation that all forms of malarial fevers prevail in the State of Alabama. During the month of September 1912 the reports indicated that one person in every fifty of the population suffered from an attack of malarial fever and during October one person in sixty-seven. The types of infection, in the order of prevalence, were tertian, aestivo-autumnal, and quartan. The chronic type of malarial infection is proportionately more frequent in the coloured race than in the white.

J. G. Thomson.

KENRICK (W. H.). **Malaria in India and the Birth and Death-Rate.**—*Lancet.* 1913. Jan. 25. pp. 233-234. With 4 text-figures.

The author states that a malarial epidemic causes a great reduction in the total number of births in the following year. This reduction begins nine months after the commencement of the epidemic, and reaches its maximum exactly nine months after the epidemic attains its maximum. Endemic malaria, on the other hand, causes no reduction in the yearly birth rate of places in which it prevails, compared with the rate of neighbouring healthy areas. It has however a marked effect upon the monthly distribution of births. With regard to the death-rate ROGERS found that 25 per cent. of the total fever mortality in a highly malarious district of Bengal might be ascribed to malaria, and ROSS estimates the true malarial death-rate of Mauritius to average about 20 per 1,000 per annum. The author compares a group of 34 healthy villages (average spleen rate 4 per cent.) with a group of 33 hyperendemic villages (average spleen rate 80 per cent.) and concludes that the malaria of the hyperendemic group caused an average increase of 12 per 1,000 in the general death rate of the group. The mortality of malaria falls most heavily on the young children aged from 2 to 8 years.

David Thomson.

ARENA (Guido). **Sindrome Cerebellare da Malaria.**—*Riforma Medica.* 1913. Feb. 1. Vol. 29. No. 5. pp. 113-122. With 6 graphs.

The author describes at length an unusual case of malignant tertian malaria, complicated by a peculiar complex of nervous symptoms, which in his opinion were undoubtedly produced by cerebellar disturbance of pernicious malarial origin. The chief features in this complex of nervous symptoms, which he terms a cerebellar syndrome, were asthenia, atony, astasia, tremors, astasia-abasia*, nystagmus, and diminution of muscular tone. This peculiar

* BLOCQ's definition of this term is as follows: "A morbid state in which the impossibility of standing erect and walking normally is in contrast with the integrity of sensation, of muscular strength, and of the coördination of the other movements of the lower extremities." (OSLER'S *Principles and Practice of Medicine*, 1912, 8th Edit., p. 1119.)

case differs from those allied cases described by Pansini, Rummo, Bevacqua, etc., in that there were no grave symptoms such as dysarthria or anarthria and no psychic disturbances. Also the graphs of the tremor show characteristic features sufficient to differentiate it from that met with in other nervous complexes, and finally the case differed from the others in that antimalarial treatment resulted in a very marked improvement of all the symptoms.

D. T.

Kaufman (Bernard). **A Case of Apoplectic Malaria.**—*New York Med. Jl.* 1913. Feb. 1. Vol. 97. No. 5. p. 243.

A case of aestivo-autumnal malaria (parasites identified) in a boy aged 14 is recorded. The boy was quite conscious at 7 a.m. In less than an hour he was apparently asleep, but could not be roused. The author was called in at 9 a.m. and found the boy still unconscious with stertorous breathing. The temperature gradually rose to 107° F. Hypodermic injections of quinine (10 grains to 40 minims of water) were given. The patient regained consciousness next day and eventually recovered.

The skin sloughed at each of the sites of injection, so that the author advocates the use of a much more dilute solution for hypodermic administration.

D. T.

Ryan (J. Charles). **A Case with Comments. Sub-Tertian Malarial Fever complicating Pregnancy.**—*Practitioner.* 1912. Dec. Vol. 89. No. 6. (No. 534.) pp. 871-873.

The author describes a case of sub-tertian malaria complicating pregnancy in a European lady in West Africa. He gave small doses of quinine at long intervals in accordance with the prevalent belief that quinine is contraindicated in pregnancy. These small doses had no effect on the malaria, so that he gave 10 grains of quinine thrice daily with bromide of potassium in similar doses. She recovered quickly from the malaria under this treatment and took 5 grains of quinine daily afterwards as a prophylactic. Eleven weeks later she had a normal labour and a vigorous child was born.

He concludes that it is futile to attempt to combat malignant malaria with small doses of quinine; and that moderate doses of potassium bromide exercise probably some control over the ecbolic tendency of quinine. The foetus survived though the pyrexia was sudden, severe and repeated. The evidence is against the general belief that pregnancy in a European residing in a malarious country contraindicates the use of quinine as a prophylactic.

D. T.

Lavinder (C. H.). **A Note on the Cultivation of Malarial Plasmodia after the Method of Bass and Johns.**—*Jl. Amer. Med. Assoc.* 1913. Jan. 4. Vol. 60. No. 1. pp. 42-43.

The author, following the technic of Bass and Johns, tried to cultivate malarial parasites from three cases.

He first attempted to grow *Plasmodium falciparum*, but growth evidently ceased before segmentation occurred. An attempt to grow *P. malariae* also failed. Another attempt to grow *P. falciparum* proved successful and the parasites in two tubes went on to sporulation, but the merozoites did not enter fresh blood cells. The author was thus able to confirm the work of Bass and Johns by cultivating the malignant tertian parasite for one generation.

Scarcity of malarial cases has prevented further experiments.

J. G. T.

Ziemann (Hans). i. **Ueber die Basssche Kultur der Malariaparasiten in vitro und die daraus sich ergebenden Resultate.**—*Centralbl. f. Bakt.* 1. Abt., Orig. 1913. Jan. 11. Vol. 67. No. 6. pp. 482-489.

ii. **Ueber die künstliche Weiterentwicklung (in vitro) des Tertian-Malariaparasiten.** [On the Development in vitro of Malarial Parasites.]—*Deut. Med. Wochenschr.* 1913. Feb. 6. Vol. 39. No. 6. p. 260.

i. The author received eight slides from Bass, a series taken from cultures of the malignant tertian parasite between 5½ and 48 hours. Ziemann gives a very full description of these and says they illustrate the process of development up to segmentation.

ii. He has also attempted to cultivate the benign tertian parasite after Bass's method. He succeeded in so far as he got half to three-quarter grown benign tertian parasites to sporulate in vitro. This occurred also in tubes to which ascitic serum had been added to the column of the patient's serum. No growth took place in the tubes which contained no glucose.

D. T.

Joukoff (N. M.). **Culture du Parasite de la Malaria.**—*Compt. Rend. Soc. Biol.* 1913. Jan. 24. Vol. 74. No. 3. pp. 136-138.

The author has attempted with considerable success to cultivate in vitro the sexual phase of the malarial parasite, as it occurs naturally in the anopheles mosquito.

Technique:—10 cc. of malarial blood was placed in four sterile tubes. To each was added ½ cc. of sodium citrate 10 per cent. Two tubes were heated to 41° C. and two to 44° C. for half an hour. These were then incubated at a temperature of 25° to 26° C. No change was noted in the tubes heated to 44° C., but in the tubes heated to 41° C. the first stages of the sexual cycle were obtained, viz.: fertilised gametes and ookinetes. The culture remained alive for 3 days.

A second experiment was made with the blood of a case of *Plasmodium malariae*. To the tubes heated to 41° C., 1½ to 2 cc. of Lock's serum was added to 4 or 5 cc. of citrated blood. With this technique the tubes exhibited not only conjugation

but also the ultimate segmentation of the fertilised elements. On the sixth day of the culture, a large number of sporozoites were found, from forms not completely divided to forms completely mature and free. The phases met with differed somewhat from those found in the stomach of the anopheline mosquito.

D. T.

Crespin (J.) & Beguet (M.). **La Courbe de l'Hémolyse dans le Paludisme. (Considérations Physio-Pathologiques.)** — *Bull. Soc. Path. Exot.* 1912. Dec. Vol. 5. No. 10. pp. 801-805.

The authors think that the pathology of acute and chronic malaria is little known in all its details, and that more research should be done on this subject. They found that the resistance of the red corpuscles is generally diminished in malaria. In a case of intermittent fever, the resistance of the corpuscles decreases during the rigor and the attack of fever. After the attack is over it again increases until the commencement of the next attack. It is during this attack that the corpuscular destruction takes place, but perhaps only in certain parts of the body, notably in the spleen and not in the peripheral blood. Punctures of this organ made at this time would let one know if the spleen of the malarial subject contained any iso- or autolysins.

D. T.

Manoiloff (E.). **Weitere Erfahrungen über Idiosynkrasie gegen Brom- und Chininsalze als Ueberempfindlichkeitserscheinungen beim Kaninchen and Meerschweinchen.** [Further Experiments on Idiosyncrasy towards Salts of Bromine and Quinine, as Symptoms of Hypersensitiveness, in the Rabbit and Guinea-pig.]—*Centralbl. f. Bakt.* 1. Abt., Orig. 1913. Jan. 23. Vol. 67. No. 7. pp. 540-544.

This article describes a successful attempt to produce passive anaphylaxis with the serum of animals which had been given salts of quinine and bromine for a long period of time. The author used well-developed rabbits and guinea-pigs which received the same food under the same circumstances. He gave them intraperitoneal injections of quinine or bromine salts daily until the animals were able to stand without bad effects otherwise lethal doses. He then bled one of these animals, obtaining about 10 cc. of activated serum, and injected it intraperitoneally or intravenously into another rabbit or guinea-pig which had not been treated with these salts. 48 hours and sometimes even 14 days after the injection of the serum, an injection of bromine or quinine salts respectively produced typical anaphylactic symptoms. The experiments were much more positive in the case of the quinine salts than with the bromine salts.

D. T.

Facciola (Luigi). **Sul Parassita dell'Infezione Malarica. Ricerche Ematoscopiche.**—*Il Morgagni.* (Archivio. Pt. 1.) 1912. July. No. 7. pp. 256-266.

The author describes at length a species of coccus which he has found in the blood of malaria patients. He apparently doubts the generally accepted cause of the disease.

D. T.

Ruge (Reinhold). **Malariaparasiten.**—*Handbuch der pathogenen Mikroorganismen.* [Herausgeg. v. Kolle (W.) & Wassermann (A. von).] 1912. 2nd Edit. Vol. 7. pp. 167-320. With 3 plates and 82 text-figures. Jena: Gustav Fischer.

This monograph deals with malaria in all its aspects, without specialising on any one point. The author gives most of the up-to-date knowledge on geographical distribution, epidemiology and prophylaxis, as well as a thorough account of the parasite in the mosquito and in the human host. In addition he gives a description of the technique in making blood preparations and in dissecting mosquitoes. The illustrations are numerous so that it should be a very suitable and useful handbook for students. The bibliography is good, though it is not quite up to date regarding crescents. The illustrations on the whole are satisfactory, although there is room for considerable improvement in the tint of the coloured figures and plates.

D. T.

BLACKWATER FEVER.

GRAHAM (W. M.). **Report on Blackwater Fever in Southern Nigeria 1899-1911.** 72 pp. With 4 plates, 4 charts and a map. 1912. London: Printed by Waterlow & Sons.

In this report the author gives data regarding 240 cases of blackwater fever occurring in Southern Nigeria 1899-1911.

He begins by discussing some of the hypotheses regarding blackwater fever:

(1) He considers that the theory that blackwater is simply an attack of pernicious malarial fever, with bilious and haemoglobinuric symptoms, is untenable.

(2) In the cases of blackwater which he has seen the onset of haemoglobinuria has been preceded by quinine.

(3) He states that if malarial fever prepares the ground for the production of blackwater fever, the incidence and severity of the latter should bear some direct ratio to the incidence and severity of the former, but this relation he believes is negatived by his data.

He considers that if the alleged close relation between blackwater fever and intense malaria be maintained then the apparent immunity to blackwater fever displayed by the negro infant will require explanation. The West African coast towns are certainly foci of intense malaria; 100 per cent. of the negro infants suffer from the disease. These are non-immune up to the age of puberty and accepting the hypothesis of malarial origin it is difficult to offer an explanation of this fact.

(4) Difficulties in regard to blackwater fever as a specific disease, due to a specific organism.

(*a*) A specific organism should be found present in all cases.

(*b*) The disease would require to have an incubation period varying between 6 and 10 months to satisfy the conditions imposed by the available records.

(*c*) One attack ought to confer some immunity.

(*d*) The disease should occur among the natives of the colony.

(*e*) The data would seem to indicate that, if it is a specific disease, it is not transmitted by domestic utensils or by parasites. But it might be transmitted by direct personal contact. In these colonies the opinion is very commonly held by non-medically educated Europeans that blackwater fever is frequently caused by habitual sexual relations with native women.

(*f*) If it is a specific disease, cases should occur occasionally in sequence in the same place or among associates. This sequence is well marked in all the available official returns.

The data show that blackwater fever is more common and shows a higher death rate among the official than among the non-official Europeans. The author thinks that this is because the average age of the official European is higher than that of the non-official.

The author has data of six cases of blackwater fever in negro inhabitants in Southern Nigeria in the period 1907-11.

His tables show that the years of severe malarial incidence do not show a corresponding increased incidence of blackwater fever, but on the contrary a decreased incidence is usually shown.

Microphotographs of sections of the kidneys and the liver in cases of blackwater fever accompany the report; also four charts showing the marked correlation between the temperature, pulse rate and the amount of haemoglobinuria; and finally a map shewing the distribution and sequence of cases of blackwater fever in the colony.

David Thomson.

Balfour (Andrew). **A Case of Blackwater Fever showing the Cell Inclusions of Leishman.**—*Jl. Trop. Med. & Hyg.* 1913. Feb. 1. Vol. 16. No. 3. pp. 35-38. With 1 plate.

The author examined blood films from a case of blackwater fever in Khartoum and found the cell inclusions and chrome cells described by Leishman. He also examined the blood by the dark-ground method but was unable to detect any spirochaetes. He is inclined to believe in Schilling-Torgau's explanation of the origin of these granules. They differ from the spirochaetal inclusions in the red cells which he has described in Sudanese fowls.

Twenty cc. of citrated blood from this patient was injected into a monkey, but it did not afterwards exhibit any signs of the disease. Balfour is inclined to the belief that blackwater fever is more a "symptom complex" than a well defined disease, and is probably due to the special action of depressing influences exerting themselves along with the malarial toxin.

He also puts forward the suggestion that blackwater may be caused by the injection of a highly virulent haemolysin by some insect.

D. T.

Werner (H.). **Ueber Cholestearin und Glyzerin beim Schwarzwasserfieber.** [Cholesterin and Glycerin in Blackwater Fever.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1913. Jan. Vol. 17. No. 1. pp. 8-11. With 2 curves.

The author administered cholesterin to a patient who showed a tendency to develop haemoglobinuria when quinine was given; no increase of tolerance to the quinine resulted. In another case of malaria where 10 cc. of glycerin were given as an enema, for constipation, an attack of haemoglobinuria was precipated. This second case also showed a predisposition to blackwater fever.

J. G. Thomson.

Yofé (Hillel). **Traitement Préventif des Fièvres Hémoglobinuriques.**—*Rev. de Méd. et d'Hyg. Trop.* 1912. Vol. 9. No. 3. pp. 166-173.

Yofé points out that an attack of blackwater fever is very often associated with the administration of quinine; since this fact has become well known to the medical world, the author has

only had three cases of haemoglobinuric fever in which quinine could not be held responsible for the attack. The first patient was an Arab child who had never had quinine, the second had taken a dose of methylene blue, 0·15 grammes, three hours before the onset of haemoglobinuria, and the third, a young girl, had taken methylene blue one hour before the attack. In a series of 46 cases of blackwater studied by the author during the last six years the three quoted above are the only ones where quinine could be entirely excluded.

In view of the fact that certain persons show this peculiar idiosyncrasy to quinine, the necessity of keeping a careful watch for those patients to whom it is dangerous to administer the drug is pointed out.

The author lays stress on the following points:—

(1) The danger of blackwater is much less if quinine is given by intramuscular injections, although this form of administration does not always prevent it. (2) The time of the administration of the drug is also of importance. If the quinine is administered during the fall of the temperature the danger of blackwater is lessened. Quinine ought not to be given during the rise of temperature. Atoxyl by injection proved useful in the treatment of a young girl who was unable to take quinine without developing haemoglobinuria. Where quinine proved dangerous methylene blue and aristochin were tried.

The following table shows the amount of blackwater fever occurring at Zicron, Palestine, and neighbourhood from 1907-1912.

Year.	No. of cases of blackwater.	Deaths.
1907	12	3
1908	8	1
1909	9	2
1910	14	4
1911	2	0
1912	1	0

In conclusion the author is perfectly convinced that in a malarious district it is possible by thorough quinine prophylaxis to reduce haemoglobinuric fever to a minimum.

J. G. T.

PROTOZOOLOGY.

Alexeieff (A.). **Quelques Remarques à propos de la Spécificité Parasitaire. Sur le Véritable Nom de *Cryptobia* (= *Trypanoplasma*) *intestinalis* et sur celui du Trypanosome Pathogène des Mammifères: quelques autres Questions de Synonymie chez les Protozoaires.**—*Zoologischer Anzeiger.* 1912. Nov. 26. Vol. 41. No. 1. pp. 17-36. With 3 figs.

This interesting and somewhat unconventional paper cannot be summarised in full owing to lack of space, but those interested should consult it in the original.

The author considers that the idea of "absolute parasitic specificity" is quite wrong, that is, that it is incorrect to describe a species of parasite as new because it happens to be found in a new host. He states that this idea is "not only inexact, but is even very harmful and contrary to the development of comparative parasitology." Two principles should be considered in general parasitology, namely, (1) that a single species of parasite can be harboured by different hosts, and sometimes these hosts are far removed from one another in zoological classification; (2) that a single host can harbour two or more neighbouring species of parasites. A "third premise" is that a morphological criterion alone is necessary and sufficient to distinguish species, as physiological and physico-chemical modifications react on the morphology of a parasite. The author also wishes to adopt a rule that no species should be accepted unless it is accompanied by differential diagnosis and figures which permit of it being distinguished from neighbouring species. As he points out, this is followed among Metazoa and ought to apply equally for Protozoa.

Certain Protozoa are then considered and their synonymy discussed, thus:—

(1) *Cryptobia dahli* (Möbius, 1888) = *Diplomastix dahlii* = *Trypanoplasma intestinalis* = *Tr. ventriculi* = *Tr. congeri* = *Heteromita dahlii* = *Cryptobia intestinalis.*

This flagellate occurs in the digestive tract of certain fishes, e.g., *Cyclopterus lumpus, Box boops, Conger niger, Motella tricirrata.*

(2) *Cryptobia borreli* (Laveran et Mesnil, 1901) = *Trypanoplasma borreli* = *Tr. cyprini* = *Tr. varium* = *Tr. gurnei* = *Tr. abramidis* = *Tr. gurneyorum.*

The parasite occurs in the blood of various fishes, of which the author gives a list.

(3) *Cryptobia helicis* (Leidy, 1846) = *Cryptoicus helicis* = *Bodo* (*Cercomonas*) *helicis* = *Trypanoplasma helicis.*

The parasite is found in the seminal receptacles of certain snails.

(4) *Cryptobia* (*Trypanophys*) *grobbeni* (Poche, 1903) = *Trypanosoma grobbeni* = *Trypanophys grobbeni.*

[The parasite is found in certain Siphonophores.]

(5) *Trypanosoma evansi* (Steel, 1885) = *Trypanosoma brucei* = *T. gambiense* = *T. rhodesiense* = *T. dimorphon* = *T. congolense* = *T. frobeniusi* = *T. pecaudi* = *T. cazalboui* = *T.*

vivax = *T. soudanense* = *T. togolense* = *T. equiperdum* = *T. equinum* = *T. hippicum* = *T. venezuelense.*

[The author considers that these are "physiological races," but has he not confused monomorphic forms like *T. vivax* with polymorphic forms like *T. gambiense*?].

(6) *Trypanosoma lewisi* (Kent,1882) = *Schizotrypanum cruzi* = *Endotrypanum schaudinni* = *T. legeri* = *T. duttoni* = *T. blanchardi* = *T. cuniculi* = *T. rabinowitschi* = *T. myoxi* = *T. microti* = *T. avicularis* = *T. theileri* = *T. franki* = *T. himalayanum* = *T. indicum* = *T. falshawi* = *T. muktesari* = *T. americanum* = *T. wrublewskii.*

Alexeieff goes further and writes "one ought to ask if *T. lewisi* itself does not belong to the species *T. rotatorium* (Mayer)?"

(7) *Crithidia lesnei* (Léger, 1903) = *Herpetomonas lesnei* = *Trypanosoma drosophilae* = *Rhynchoidomonas* (pro *Rhynchomonas*) *luciliae* = *Leptomonas muscae domesticae* pro parte = *Cystotrypanosoma intestinalis* = *Herpetomonas muscae domesticae* pro parte.

The author states that "true trypanosomes are not known in non-biting insects, and it is very probable that they do not exist in them." "The trypanosomes are parasites peculiar to the blood of vertebrates."

(8) *Leishmania.* The author states that this genus is not "autonomous." *Leishmania* represents a stage in the development of *Trypanosoma* (*T. lewisi*). The "leishmanioses" are then only trypanosomiases. The genus *Leishmania* cannot be placed in that of *Herpetomonas.* There is no *Herpetomonas* in vertebrates, just as there is no *Trypanosoma* in invertebrates. [But *Leishmania* in culture develops into a herpetomonad, not a trypanosome].

(9) *Sarcocystis miescheriana* (Kühn, 1865) = *Synchytrium miescherianum* = *Sarcocystis* (*Gregarina*) *lindemanni* = *S.* (= *Miescheria*) *muris* = *S.* (= *Balbiania*) *mucosa* = *S. tenella* + *Balbiania gigantea* = *S. hominis* = *S. blanchardi* = *S. bertrami.*

The author states that there is only one species of Sarcosporidia.

(10) *Dimastigamoeba gruberi* (Schardinger, 1899) = *Amoeba gruberi* = *A. punctata* = *Vahlkampfia punctata* = *Nägleria punctata.*

These are amoebae of the *limax* group with flagellispores.

At the beginning of his paper the author states, in a footnote, that the *Entamoeba* (*E. aulastomi*) described by Nöller (1912) in the leech *Haemopis sanguisuga* (= *Aulastomum gulo*) is *E. ranarum.*

H. B. Fantham.

Nöller (Wilhelm). **Die Blutprotisten des Wasserfrosches und ihre Uebertragung. (Vorläufige Mitteilung).** [The Blood Protista of the Frog and their Transmission.]—*Arch. f. Protistenkunde.* 1913. Jan. 22. Vol. 28. No. 2. pp. 313-316.

Nöller's paper is a preliminary account of what promises to be most interesting results of his investigations on the blood parasites of frogs (*Rana esculenta*). He worked at a pisciculture institute at Dörnfeld-Gräfinau, on the Ilm, in Thuringia.

The parasites observed were *Trypanosoma rotatorium* Mayer, *Dactylosoma splendens* Labbé, *Lankesterella minima* Chaussat (= *L. ranarum* Lankester) and *Cytamoeba bacterifera.*

(1) *Trypanosoma rotatorium.*—Nöller gives a brief historical outline and states that the trypanosome cannot be transmitted from frog to frog by *Helobdella algira* in Germany, though França found that to be the case in Portugal, since the leech does not occur in Germany. *Hemiclepsis marginata* is the transmitter and in its stomach both unchanged and developmental forms of the flagellate occur. Nöller states definitely that *H. marginata* transmits *T. rotatorium* from tadpole to tadpole. He is not certain if *Piscicola geometra* has any share in the transmission.

(2) *Dactylosoma splendens* was not observed by Nöller except in the vermicular phase. No " daisy-like " schizogony was observed. He considers the organisms should be placed in the Haemosporidia between the Plasmodia and the Piroplasmata.

(3) *Lankesterella minima,* Chaussat (= *L. ranarum* Lankester) has typical haemogregarine-like schizogony. The schizonts never occur in the peripheral blood, but only in the endothelium of the internal organs. The merozoites and gametocytes of *Lankesterella* are distinguished from the gametocytes of *Dactylosoma* by the possession of two vacuoles near their nucleus and by their nuclear structure. Nöller states that he has found by experiments that the vermicules of the *Lankesterella* enter the gut-epithelium of *Hemiclepsis marginata* and they can be recognised there for about six weeks.

(4) *Cytamoeba bacterifera* has been found in the erythrocytes of frogs, with the bacterial rods arranged at the periphery of the vacuole. Similar rods have been found in the proboscis sheath and stomach diverticula of *Hemiclepsis marginata*, but it is uncertain whether they are identical with those of *Cytamoeba.*

H. B. F.

Chatton (E.). *Leptomonas* de deux *Borborinae* (Muscides). Evolution de *L. Legerorum,* n.sp.—*Compt. Rend. Soc. Biol.* 1912. Aug. 2. Vol. 73. No. 28. pp. 286-289.

(I.) *Leptomonas legerorum* of *Sphaerocera subsultans.*—The host (*S. subsultans*) is a small coprophagous fly, 11 out of 16 flies being parasitised. The monadine or flagellate parasites are 15μ to 25μ by 6μ to 12μ. They are most numerous in the mid-gut. Postflagellates which are gregarine-like and spermoid (with nucleus and blepharoplast in conjunction posteriorly), occur in the hind gut. Cysts, with separate nucleus and blepharoplast, were also seen.

The imaginal infection is endotrophic, that is, the flagellates occur within the lumen of the gut, along the area lined by the peritrophic membrane, and in contact with the food particles. The larval infection is peritrophic, that is, the parasites occur localised in the space between the intestinal epithelium and the peritrophic membrane, and free from food particles. In the first

case (endotrophic) the flagellates may be fixed to the inner surface of the peritrophic membrane; in the second case the parasites may be attached to the intestinal epithelium. There is, then, no continuity between the larval and imaginal infection. The flagellates of the larva, after metamorphosis, are eliminated with the "yellow body." The infection of the imago is a new infection.

(II.) In another Borborine fly, *Limosina thalammeri*, the author found another *Leptomonas* (species unnamed). The infection in the adult fly was endotrophic (a simple culture), the rectum being uninfected. The larval fly was not infected.

The paper is illustrated by 14 text figures.

H. B. F.

Chatton (E.). *Leptomonas Roubaudi*, **n.sp., Parasite des Tubes de Malpighi de** *Drosophila confusa* **Staeger.**—*Compt. Rend. Soc. Biol.* 1912. Aug. 2. Vol. 73. No. 28. pp. 289-291.

Leptomonas roubaudi is a new flagellate found by the author in the Malpighian tubules of the Muscid, *Drosophila confusa*. This newly found flagellate is distinct from *Leptomonas drosophilae* (in the intestine) and *Trypanosoma drosophilae* (in the Malpighian tubules) which commonly occur in the same fly.

L. roubaudi exists in the larva and the adult. Many of the parasites are attached to the epithelium. Flagellate and post-flagellate encysted forms occur. Large immobile individuals measure up to 30μ in length. Gregarine-like forms divide longitudinally.

The author compares this herpetomonad with members of the genus *Cercoplasma* (Roubaud).

The paper is illustrated by 11 text-figures, [and shows the importance of considering the possibility of multiple infection of flagellates in an insect host, which flagellates might easily be mistaken for various developmental stages of a single parasite.]

H. B. F.

Ashworth (J. H.) & Rettie (T.). **On a Gregarine—***Steinina rotundata*, **nov. sp.—present in the Mid-gut of Bird-Fleas of the Genus** *Ceratophyllus.*—*Proc. Roy. Soc.* 1912. Dec. 17. Series B. Vol. 86. No. B. 584. pp. 31-38. With 1 plate.

The Gregarine was found chiefly in the alimentary tract of *Ceratophyllus styx* occurring in sand-martin's nests. Also, a few gregarines were observed in *C. farreni* (from nests of the house-martin) and *C. gallinae* (from nests of the blue-tit). The fleas were collected from birds in the Scottish Lowlands. The authors review the previous records of Gregarines in fleas, but their parasite differed therefrom.

The Gregarine belongs to the family *Actinocephalidae*, genus *Steinina*. The species is new, *S. rotundata*. No intracellular stage was found. The adult trophozoite is pyriform and septate and is differentiated into epimerite, protomerite and deutomerite; the epimerite attaches the gregarine to the gut-epithelium during

part of its life. In the younger trophozoites the protomerite and deutomerite together usually form an oval or sub-spherical mass. The adults, which may be 180μ long by 70 to 80μ broad, are solitary except when associated in pairs preparatory to the formation of gametes. The cysts are spherical, 110 to 185μ in diameter and contain numerous spores; they occur in the mid-gut of the flea. Each spore contains 8 sporozoites. The spores are ingested by larval fleas, and early trophic phases occur therein.

The paper is well illustrated.

H. B. F.

Marullaz (M.) & Roudsky (D.). **Contribution à l'Etude de *Haemogregarina terzii* Sambon et Seligmann.**—*Compt. Rend. Soc. Biol.* 1913. Jan. 24. Vol. 74. No. 3. pp. 128-131.

H. terzii occurs in the blood of the *Boa constrictor*. In the paper the authors record their observations on the structure of the nucleus of the parasite, as seen in "wet fixed" preparations, using corrosive-alcohol and staining with ammonia-alum-haematoxylin, or with Giemsa. Details of the ammonia-alum-haematoxylin method are given.

The nucleus is elongate and large. Nuclear polymorphism was observed and considered by the authors to "correspond with different stages of evolution of the haemogregarines."

The nucleus of the medium-sized parasites exhibited a coarse spiral thread of chromatin of 4 to 5 turns, or more often it consisted of four, five or six chromatin masses arranged somewhat serially, while some nuclei consisted of granules of chromatin 8 to 25 in number.

Multiplicative forms of the parasite were seen in the liver of the host. Free forms were found in heart blood.

No blepharoplast was observed and the interpretation of Carini that a blepharoplast occurred in *H. tupinambis* is doubted.

The authors do not consider that the parasites exhibit sexual characters.

The paper is clearly illustrated by nine text-figures.

H. B. F.

França (C.). **Les Hémogrégarines des Sauriens. Réponse au Dr. Woodcock.**—*Bull. Soc. Portugaise des Sciences Naturelles.* 1913. Vol. 6. No. 1. pp. 47-54.

The author protests against the statement of Woodcock (see this *Bulletin* No. 5, p. 264) that certain species of Haemogregarines, *H. nobrei*, *H. bicapsulata*, *H. marceaui* and *H. nana*, occurring in the lizard *Lacerta muralis*, are different forms of a single species, *Karyolysus* (*H.*) *lacertae*.

He quotes the researches of Laveran and Pettit on the Haemogregarines of *Lacerta muralis* from France and Portugal in support of his work, and maintains his original views.

H. B. F.

Fantham (H. B.) & Porter (Annie).—**Some Effects of the Occurrence of Myxosporidia in the Gall Bladder of Fishes.** (Preliminary Communication.)—*Ann Trop. Med. & Parasitol.* 1912. Dec. 30. Vol. 6. No. 4. pp. 467-481.

In this paper the authors record the preliminary results of their examination of over 100 marine fishes—both Teleosts and Elasmobranchs—for Myxosporidia. The examinations were made at Luc-sur-Mer, Normandy, and many of the fish were of kinds commonly used for food.

The Myxosporidian parasites, belonging to various genera, have been regarded previously as well-nigh harmless. It was found, however, that such was not the case, for the colour and consistency of the bile were seen to be altered from bright green to yellowish or brownish, much mucus being present, while there was thickening of the wall of the gall bladder. A catarrhal cholecystitis occurred, as shown by leucocytic infiltrations around the small blood vessels in the fibro-muscular coat of the infected gall-bladder, in some parts of the sub-serous layer and at the bases of some of the papillae of the mucosa. Numerous mucous cells occurred at various points in the epithelium. In some cases, processes from myxosporidian trophozoites could be clearly seen penetrating the epithelium. Some of the fish showed inflammation of the intestine and were emaciated.

[Although these investigations were not made on fish from tropical seas, doubtless such parasites occur in them, perhaps more intensely. The notice of workers in the tropics is briefly drawn to myxosporidiasis in fish.]

H. B. F.

SLEEPING SICKNESS.

Transmission.

Robertson (Muriel). **Notes on the Life-History of *Trypanosoma gambiense*, with a brief Reference to the Cycles of *Trypanosoma nanum* and *Trypanosoma pecorum* in *Glossina palpalis*.** —*Philosophical Trans. Roy. Soc. London.* 1913. Jan. 31. Series B. Vol. 203. No. B. 298. pp. 161-184. With 5 plates.

An abstract of this paper has already been reviewed at length (see this *Bulletin* No. 5, pp. 267-268). It will not be necessary to recapitulate that review, but rather to add to it.

At the outset the author notes that hereditary infection of *Glossina palpalis* with flagellates may be considered to be "invariably negative."

Many cytological details are given in the paper. Regarding the division of the trypanosomes in vertebrate blood, it is stated that the "flagellum splits, but never throughout the whole length; it becomes free about two-thirds of the way down, and the flagellum of the daughter-individual is usually shorter than that of the parent."

Considering the exogenous cycle in the fly, the author states that the "inability on the part of the parasites to maintain themselves in the proventriculus during a fast becomes of some importance in the cycle when the habits of the wild flies in regard to feeding . . . are remembered. The majority of wild flies are obviously exposed to fasts of considerable duration, and it is this circumstance, combined with the peculiarity of the trypanosomes just mentioned, that seems to necessitate some seat of attachment for the trypanosomes anterior to the proventriculus in all cycles developing in *Glossina palpalis*. In *T. gambiense* the flagellates invade the salivary glands; in *T. pecorum* and *T. nanum* . . . they attach themselves in the proboscis after having gone through a gut-development not unlike that of *T. gambiense*; in *T. vivax* and *T. uniforme* the whole cycle takes place in the proboscis. There is at present, as far as I am aware, no case of a completely investigated gut form carried by *Glossina palpalis* being transmitted directly from the alimentary canal without some definite secondary focus occurring anterior to the proventriculus."

T. pecorum develops in *G. palpalis*, "but the cycle is so extraordinarily slow, and the transmission so difficult to effect, that it appears . . . that this fly is at most only a facultative intermediate host for *T. pecorum*." "The flagellates [therein] are more massive and larger" than in *T. gambiense* and *T. nanum*.

The author's summary is as follows:—

"1. *T. gambiense* undergoes an endogenous cycle of development in the vertebrate in the circulating blood. This cycle is of irregular duration and is repeated many times in the course of the disease.

"2. The short forms may be regarded as the adult blood-types; the intermediate types are growth-forms, proceeding to the long individuals, which are those about to divide. The products of division give rise,

directly or indirectly, to the adult forms. The adult forms appear to be alone responsible for carrying on the cycle in the transmitting host.

"3. The multiplication occurs in the circulating blood.

"4. Multiplication of the parasites was never found within the cells of the liver, spleen, or lungs in monkeys.

"5. Rounded non-flagellate types were found on one occasion in the lung, liver, and spleen of a virulently infected monkey. They appear for the most part to be destined to destruction, but it is not excluded that they may survive in small numbers as latent forms.

"6. In the fly the trypanosomes are first established in the posterior part of the mid-gut. Multiplication occurs and trypanosomes of very varying sizes are produced.

"7. From the 10th or 12th day onwards slender long trypanosomes are to be found in increasing numbers. These finally move forward to the proventriculus and are the dominant, though not the only, type seen there. The proventriculus becomes infected as a rule between the 12th and 20th days.

"8. The salivary glands become infected by the slender proventricular types. They reach the salivary glands by way of the hypopharynx; arrived in the gland, they become attached to the wall and assume the crithidial condition. Multiplication occurs and finally small trypanosomes are produced, closely resembling the blood type. The passage through the crithidial stage is characteristic of the salivary development and the trypanosome forms just mentioned are derived from the crithidial types. The development in the salivary gland takes from two to five days before the forms are infective.

"9. The fly is never infective until the glands are invaded. Trypanosomes from the proventriculus when injected into a monkey never produce infection. Trypanosomes may be found in the salivary glands as early as the 16th day of the cycle. An early infection of the salivary glands is always preceded by a very virulent and rapid gut infection.

"10. The trypanosomes are never attached to the wall of the alimentary canal, and there is no intracellular multiplication in the gut cycle. A crithidial stage does not occur in the gut cycle. The trypanosomes are never found in the body cavity nor are they ever established in the rectum.

"11. Conjugation has not been observed, nevertheless the fly cycle as a whole has the biological significance of conjugation.

"12. The cycles of *T. nanum* and *T. pecorum* agree with that of *T. gambiense* in showing a gut development without a crithidial phase. The crithidial phase occurs in the proboscis, where the flagellates attach themselves. The salivary glands are never infected in the case of *T. nanum* and *T. pecorum*."

The paper is illustrated by 60 figures of *T. gambiense*, 8 of *T. nanum* and 6 of *T. pecorum*.

[In reference to Miss Robertson's conclusions on the trypanosome cycle in vertebrate blood the reviewer wishes to draw attention to the enormous amount of work done on this subject by various investigators in Liverpool, some three years ago. Further, it is of interest to note that the forms of *T. gambiense* found by J. G. Thomson and Sinton (1912) in cultures (see this *Bulletin*, No. 1, pp. 53-54) resemble in detail those found in the gut of the fly.]

H. B. Fantham.

Roubaud (E.). **Relations Bio-géographiques des Glossines et des Trypanosomes.**—*Bull. Soc. Path. Exot.* 1913. Jan. Vol. 6. No. 1. pp. 28-34.

Transmission experiments show that tsetse flies which are given infective feeds do not all contract salivary infection. If the number of the infective feeds is increased more flies become infected, but there are always some which remain free. An

instance is given from an experiment with *T. cazalboui*. The flies are not therefore, the author writes, at all times susceptible of contracting infection; they must be in a condition of receptivity. This receptivity, the author considers, applies only to salivary infection and may be independent of infection of the digestive tube.

Observations of natural infection of tsetse flies has shown for different districts that flies of different species frequenting the same district are not infected in the same proportions nor in the same manner. Thus in Lower Dahomey *T. cazalboui* was found to predominate in *G. longipalpis* and *palpalis*, *T. dimorphon* in *longipalpis* and *tachinoides*, *T. pecaudi* in *longipalpis*. In Upper Dahomey, on the other hand, *T. pecaudi* predominated in *morsitans*, and in Casamance *T. dimorphon* in *morsitans*. The author thinks these differences are the result of modifications of receptivity of the flies according to the bio-geographical influences to which they are submitted. As regards *T. cazalboui* in *G. palpalis* he notes that the proportion of flies experimentally infected in the regions investigated by him were in Middle Dahomey 40 per cent. and in Upper Casamance nil, though repeated attempts were made to infect the flies. These differences were confirmed by the examination of natural infections. In Middle Dahomey one fly in thirty was naturally infected with *T. cazalboui* and in Upper Casamance of 560 flies examined there was only one case of proboscis infection. Souma existed in each region, but in one case must have been transmitted by another species of tsetse. Again, he contrasts the ease with which Kleine and Bruce transmitted *T. gambiense* by *G. palpalis* and the non-success of Bouet and himself in Dahomey and Casamance. In these latter regions human trypanosomiasis does not exist or is rare. Thirdly, the results of Kinghorn and Yorke are mentioned in the valley of the Loangwa and on the plateau respectively (*G. morsitans* and *T. rhodesiense*). Fourthly, the non-success of Kleine and Fischer with *G. morsitans* and *T. gambiense* on the Victoria Lake, and the success of Taute on Tanganyika with the same species. From these data the author deduces that the receptivity of a given species of Glossina for a given virus is not uniform throughout the extent of the species' distribution. Receptive and refractory or indifferent races thus occur in nature.

In his opinion it is not correct to say that climatic factors exercise an influence on the evolution of trypanosomes in tsetse flies. This influence is only an indirect one, and this is shown by the fact that in a region where several species of tsetse exist certain species are favourable to a virus while others are not. Though the climatic factors are the same, the different species of Glossina react differently; their receptivity is not the same.

It appears then that a virus will be endemic only in areas where there exist receptive races. Owing to the natural migrations of flies there are constant exchanges between the areas of receptivity and indifferent areas. This seems to explain the existence of sporadic cases of trypanosomiasis in certain regions where, in spite of the great number of flies, trypanosomiasis is not common.

In such areas not only are there few cases, but there is a tendency to mildness of type of the disease. It is possible that geographical influences acting on an infected tsetse coming from an area of normal endemicity are able to attenuate the parasites in the salivary fluid and even at length to disinfect the fly. It follows that the presence of numerous tsetse flies in a region must not always be considered *a priori* as a danger to man or domestic animals. The introduction of a virus into a tsetse area where it does not already exist must not necessarily be considered as dangerous. It also follows that to get the best results from deforestation this measure ought to be preceded by experimental examination of the receptive properties of the flies, or at least by an estimation of their natural infecting power.

A. G. B.

Fischer (W.). **Experimentelle Untersuchungen über die Rolle der *Glossina morsitans* als Ueberträgerin der Schlafkrankheit am Viktoriasee.** [Experiments on the Rôle of *Glossina morsitans* as Carrier of Sleeping Sickness on the Victoria Lake.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1913. Feb. Vol. 17. No. 3. pp. 73-85.

This paper contains details of transmission experiments on the Victoria Lake, an account of which has been given in this *Bulletin* (No. 5, p. 270). The experiments showed that occasionally at the level of the Victoria Lake *Trypanosoma gambiense* can undergo its complete development in *Glossina morsitans*. It was concluded that other species of tsetse fly, such as *G. fusca* or *G. tachinoides*, may occasionally act as hosts for *T. gambiense* and it is recalled that R. Koch saw a commencement of development of *T. gambiense* in *G. fusca*.

Some notes are added on the biology of *Glossina morsitans*. Of the flies used in the transmission experiments 636 were males and 766 females. On the 71st day there were still alive 135 males or 25 per cent. and 265 females or 39 per cent. Here again it is seen that the females were more tenacious of life than the males. The bred *G. morsitans* began to drop larvae about the twentieth day. The pupal stage lasted on an average 35 to 40 days. Pupation in the body of the mother was found eleven times; the pupae were in every case dead.

Additional evidence is given that trypanosomes are not conveyed hereditarily in tsetse flies. It is noted that the monkeys employed in the experiments never showed trypanosomes of any kind.

A. G. B.

Dr. Philip H. Ross, Bacteriologist, East Africa Protectorate, reports that he has succeeded in infecting a monkey with trypanosomes by the bite of *G. longipennis*. Freshly caught flies were kept after arrival at Nairobi in an incubator at 25° C. The monkey was bitten 577 times between December 5th, 1912, and January 11th, 1913. Trypanosomes were found on January 13th. The author would, for the present, class them in the *T. dimorphon* group.

A. G. B.

Clinical.

Martin (Louis) & Darré (Henri). **Un Cas de Trypanosomiase Humaine contractée au Laboratoire.**—*Bull. Soc. Path. Exot.* 1912. Dec. Vol. 5. No. 10. pp. 883-891.

The authors point out that this case is interesting from three points of view: the infection was contracted in the laboratory in the study of animal trypanosomiases; the patient had acute nephritis which disappeared with atoxyl treatment; and the constant reappearance of relapses in spite of regular treatment led them to increase the frequency of the doses instead of augmenting them.

The patient was an Italian professor, aged 34, who entered the hospital at the Pasteur Institute in May 1912. For eighteen or twenty months he had been getting thin and had often complained of headache. In August and September 1911 he had several febrile attacks lasting two or three days, which were put down to pappataci fever. In March 1912 he noticed that his urine was red, but he did not examine it. In April he had high fever lasting several days, attributed first to toxic infection from the intestine, then to typhoid fever, and then to paratyphoid. This fever lasted eight days and reappeared after four days' apyrexia, the second attack lasting seven days. During a third attack the blood was examined and trypanosomes were found. Atoxyl was injected on April 26th and 30th. On May 2nd there was general oedema, more especially of the face and extremities; the urine contained albumin. On May 6th 0·85 gm. atoxyl was injected and on May 13th and 16th smaller doses. The patient then went to Paris.

On admission to hospital he was found to have the usual symptoms of African trypanosomiasis: emaciation, anaemia, asthenia, enlargement of the cervical, axillary, and inguinal glands; enlargement of the spleen, and to a less extent of the liver; raised temperature with acceleration of pulse; and patches of roseola on the trunk; there were no nerve symptoms. In addition the urine was scanty and deep coloured, and contained albumin, blood, granular casts, and numerous renal cells; there were no other symptoms of nephritis. The blood contained very numerous trypanosomes; there were none in the urine. On the succeeding days the patient was treated with atoxyl and tartar emetic. Three days after admission the albuminuria had disappeared. Between May 22nd and June 14th he had seventeen injections of 0·1 gm. tartar emetic and four injections of atoxyl, 0·5 gm. During this time his condition was very good and there were no trypanosomes. On June 14th the temperature went up a little and on the 15th there was albuminuria. Atoxyl was given and the albuminuria disappeared; this occurred a third time. On July 13th the patient left the hospital and was advised to continue the atoxyl injections every five days. He however relapsed again. From October onwards he had the injections every four days; there has been no further relapse.

The authors say that the infection was undoubtedly contracted in the laboratory; the patient had never lived in Africa. The precise moment of infection is unknown; it is probable that it was due to small excoriations of the skin, considered of no importance. The precise nature of the virus is also unknown. His researches were chiefly made with nagana. They think that from the symptoms and course of the disease the infection is comparable with that of *T. gambiense*. The acute nephritis was undoubtedly caused by the trypanosomes because it disappeared only when atoxyl was given and this on three occasions. The authors have only once before observed nephritis in a sleeping sickness patient, and he had reached the last stage. They compare this form of nephritis with that caused by syphilis, which is only cured by antisyphilitic treatment. They note that numerous

relapses occurred in spite of regular treatment. However they do not think that the trypanosomes were atoxyl-fast, because they were controlled when more frequent doses were given. Atoxyl fastness in their opinion is rare in human pathology. They remark that the atoxyl was sterilised by heating to 110° in the autoclave; this is in their opinion the best way of preparing it; it must then be kept in the dark or it will decompose. With regard to the increased frequency of the doses they considered that this would prevent the parasites from multiplying. They suggest that there may be several types of trypanosomes with cycles of multiplication in the blood of different duration, which would be analogous with malaria.

Massil said that he had procured the virus with which Professor L. was working and had also obtained two mice and a guinea-pig inoculated with his blood. The laboratory virus, he stated, was nearer to *T. evansi* than to *T. brucei* or *T. togolense*. With regard to the trypanosome from the patient, its biological properties are different and its affinities appear to be with *T. gambiense*. Mice injected had usually a chronic disease. The trypanosome was refractory to human serum. He intended to make experiments of active crossed immunity before coming to any conclusion.

A. G. B.

Ranken (H. S.). **Report on the Work of the Commission in the Yei River District, Lado Enclave, for the Year ending 30th September, 1912.** [MS., forwarded by the President, Sudan Sleeping Sickness Commission.]

The last report on this District was summarised in *Sleeping Sickness Bulletin*, Vol. 3, p. 473. A map was there published showing the sleeping sickness areas in the Lado Enclave. Ranken says that these areas have extended eastwards. In some villages fresh cases are found at every inspection: these villages are very badly situated, the whole of the surrounding district being beset with fly-infested khors. It is remarked that much cannot be expected of village moving, there being no large isolated fly-free region. The original clearings made at Yei have been kept up; the work now consists in cutting down the grass and a few shrubs, the trees having been all destroyed on the first occasion. Cultivation on the cleared areas has been found to be impracticable. The following figures are given for the sleeping sickness camp:

Total number admitted up to September 30th, 1911	269
Total number admitted from September 1911 to September 1912	139
Total	408
Deaths up to 30th September 1912	88
Permanent desertions	6
Number of cases in camp September 30th, 1912 ...	314

39·2 per cent. of the above number have survived eighteen months and 70 per cent. for one year. The majority of the cases are young adults and middle aged, but the disease has been seen at all ages from the very old to the age of two.

There are now 35 infected villages in the district which are inspected systematically. A table is given showing the number of cases admitted from each village with the percentage of population infected. Everyone coming into Yei is sent for gland palpation; several cases have thus been detected. The total number of palpations at village inspections is 20,000, and at Yei itself 14,000; 695 persons have been examined by the gland or blood film method and 139 found to be infected.

As to the methods of diagnosis the author does not think that the system of examination and palpation by native inspectors can be satisfactory. The routine at Yei is that all cases with symptoms or suspicious glands are examined by gland puncture. If the first puncture is negative, a second is done. If this also is negative, an examination is made of fresh blood. At least fifteen minutes is allowed for each slide. He thinks that owing to the facility and rapidity of diagnosis by gland puncture fresh blood examination is falling into desuetude. In some cases he has found a trypanosome after a short search in the first drop of blood examined, when the parasites were only found in the second gland punctured. In two instances, which are given, several gland punctures failed to show trypanosomes, but they were found easily in the blood.

The drugs used have been metallic antimony (Plimmer), atoxyl, salvarsan, and arsenophenylglycin with tryparosan. The treatment of seven cases by salvarsan was described in *Sleeping Sickness Bulletin*, Vol. 3, p. 474. Three of these patients are alive and well, having been without treatment for over a year; three are dead, and the remaining case has relapsed. A further series of ten cases is being treated by the same method.

A table of symptoms observed on admission to camp of the last hundred cases is as follows:—General tremor 7, tongue tremor 37, tremor of hands 9, oedema of eyes 18, skin eruption 1, ataxy 3, slurring speech 1, mental cloudiness 5, 'sleeping' 5, mental symptoms 6, asthenia with marked malnutrition 22. Adenitis was present in all cases. Auto-agglutination has been by no means invariable; much time would seem to have been lost searching for trypanosomes in some such cases. The author suggests that the presence of *Filaria perstans* has some influence in regard to this phenomenon, and refers to a case mentioned by May (see *Sleeping Sickness Bulletin*, Vol. 4, p. 199). An extremely fine fibrillary tremor of the tongue was the most common symptom next to adenitis; it is to be distinguished from the coarse tremor which is a late symptom. Somnolence is considered to be a relatively early symptom of cerebral involvement. Two cases admitted seventeen months before and noted then as drowsy were very well at the time of writing. Two other patients have been free from drowsiness for six months. In three cases in children the author has been much impressed by their forwardness or lack of shyness, a feature absent in the other healthy children. This precocity, he says, was very striking. There have been two cases of blindness, one in a very old, the other in an advanced case; the author attributes the condition to the disease in each instance.

He gives the history of a case which was under observation before the diagnosis. The patient was a boy employed by one of the Sudan Sleeping Sickness Commission officials for eighteen months, during which he was frequently examined. Two months before his case was diagnosed he became ill with diarrhoea and gastric disturbance, and a few days after was found to have dilatation of the heart, oedema of the feet and legs, and albuminuria. Later it was noticed that there was some enlargement of the glands of the neck, and trypanosomes were found on puncture.

Laboratory work has been directed to the investigation of patients after treatment and observations on the infective granule in trypanosomiasis. A few animals were shot near Yei and examined for trypanosomes. Parasites of the *brucei* type were found in a waterbuck.

A. G. B.

Treatment.

Riquier (J. C.). **Das "606" bei der experimentellen Infektion durch *Trypanosoma Brucei* und durch *Trypanosoma equiperdum*.** ["606" in Experimental Infection by *T. brucei* and *equiperdum*.]—*Zeitschr. f. Immunitäts-forschung u. Exper. Therapie.* 1912. Dec. Vol. 16. No. 1. pp. 92-101.

The author's experiments were made with strains of nagana and dourine, the experimental animals being rabbits. The drug was injected intramuscularly as soon as the trypanosomes were present in considerable number in the circulating blood and the animals had characteristic symptoms of the disease. In every case a prompt improvement was noticed. Examination of fresh and stained films showed that the trypanolytic action of the drug was very rapid, the parasites disappearing in from one to three hours. An account is given of the animals which were infected and treated. In every instance the trypanosomes disappeared as the result of the injection and the blood taken a few days later was non-infective to rats; later trypanosomes reappeared and death followed. The non-infective period lasted from one to six days and possibly longer.

Seeing that the blood became sterile after the injection the author supposed that the trypanosomes might be present in the internal organs; he therefore made a second series of experiments. In these the animal was killed a few days after the administration of the drug. Portions of its organs were then inoculated into white rats—heart-blood, spleen, liver, lymphatic glands, bone marrow, nervous system. It was thus shown that only the bone marrow and less frequently the lymphatic glands and spleen were able to produce infection. Typical trypanosomes were never found in these, but within connective tissue cells and endothelial cells there were seen rounded forms which do not occur in rabbits uninfected with trypanosomes. The author has previously described such forms in the organs of rabbits suffering from dourine. Putting these observations together, namely, the sterility of the blood after an injection of '606,' the infectivity of the bone marrow, spleen, and lymph gland emulsions, and the presence of these endocellular forms, he suggests it is justifiable to assume a connection between these forms and the relapses. He

has, however, never seen transition forms between these bodies and trypanosomes, and thinks that more investigation is needed.

[Plimmer and Bateman after treatment of nagana-infected rats with antimony found that the bone marrow was infective when the blood was incapable of conveying infection. In the case of rabbits infected with *T. gambiense* and *T. equiperdum* trypanosomes have been found in numbers in this situation (Bentmann and Gunther; Beck; Zwick and Fischer). Buchanan found ' developmental forms ' of *T. brucei* (*pecaudi*) in the spleen, bone-marrow, and axillary glands of infected gerbils.]

A. G. B.

Salmon (Paul). **L'Acridine dans le Traitement de la Maladie du Sommeil Expérimentale.**—*Compt. Rend. Soc. Biol.* 1913. Jan. 24. Vol. 74. No. 3. pp. 134-136.

Certain dyes of the acridine or oxazine series attack trypanosomes in a special way: there is vital staining of the blepharoplast, it disappears, and finally the parasite is destroyed. The author, investigating these dyes, found that they have a favourable therapeutic action in trypanosome infections, especially of *T. gambiense*. The virus employed killed mice regularly in six days. The dye which gave the best results was trypoflavin A (acridine) given subcutaneously. In two instances it was found to have a preventive action when given together with the virus. Six mice were treated on the fourth day of infection; all but one recovered. The relation between the maximum and the minimum therapeutic doses was more than $\frac{1}{5}$, showing that there is a good margin between the curative and the toxic doses. The trypanosomes were found in the blood several hours after the injection.

A. G. B.

Brieger (L.). **The Chemical Therapeutics in Trypanosomes Infection after Delivery through the Mouth.***—*Jl. State Medicine.* 1913. Feb. Vol. 21. No. 2. pp. 115-117.

The substance of this paper was reproduced in *Sleeping Sickness Bulletin*, Vol. 4, p. 328. The present paper contains nothing new.

A. G. B.

Immunization.

Novy (F. G.), Perkins (W. A.), & Chambers (R.). **Immunization by Means of Cultures of *Trypanosoma lewisi*.**—*Jl. Infectious Diseases.* 1912. Nov. Vol. 11. No. 3. pp. 411-426.

In a previous paper Professor Novy showed that cultures of *Trypanosoma lewisi* when plasmolyzed were capable of producing immunity in rats. At the same time it was pointed out that cultures of *T. lewisi* and *T. brucei*, even after having passed through 100 generations in the course of two years, did not become attenuated but readily infected. The culture of *T. lewisi* used for the present experiments was isolated from a rat in September 1905 and has been maintained on ordinary blood agar media at

* This title seems to be a translation of the German—"*Chemotherapie bei Trypanosomeninfektion nach Verabreichung per os.*"

25°. It is now in the 313th generation. It was at first readily infective and this property persisted till March 1909, the culture being then in the 158th generation. It was then found to be non-infective; it had become fully attenuated. All attempts to restore the infective character of this culture have been fruitless. The majority of inoculated rats, however, showed in their blood within the next day or two a small number of typical blood trypanosomes. These usually disappeared within 48 hours. Blood containing these trypanosomes was injected into clean rats and planted at the same time on blood agar, but it failed to infect the rats or to give cultures. These trypanosomes are in fact incapable of further multiplication or reproduction; they are sterile or abortive forms.

By means of this attenuated culture the authors were able to obtain a solid and permanent immunity in rats. Young rats were employed and a very small but surely infective dose of the virulent organism, owing to the fact that a very large dose of virus may readily break down a slight immunity. In the first series of experiments a single injection was made of two or six cultures. When the interval between the injection of the vaccine and the test dose was two or three days there was a rich infection, showing that little or no immunity existed. There were some mild infections with an interval of ten and even seventeen days, but these did not persist long. It was evident that immunity was produced by the injection of living cultures of *T. lewisi* and that this immunity was most pronounced after the lapse of about ten days. There was a notable difference in immunity production according to whether the vaccine was introduced intraperitoneally or subcutaneously. When given subcutaneously a much larger dose was required to obtain protection. These results are shown in tables. This active immunity once developed probably persists until the death of the animal; up to the present it has not been tested for a longer period than five months.

Duration of Immunity following the Single Injection of Living Cultures.

Rat No.	Received.	Interval before Test Dose.	Test Dose of *Tr. lewisi* Blood.	Result.
1	2 cultures ...	35 days ...	0,0001 cc. ...	0
2	„ „ ...	„ „ ...	„ „ ...	0
3	6 „ ...	42 „ ...	„ „ ...	0
4	„ „ ...	„ „ ...	„ „ ...	0
5	6 „ ...	74 „ ...	„ „ ...	0
6	„ „ ...	„ „ ...	„ „ ...	0
7	2 „ ...	78 „ ...	„ „ ...	0
8	„ „ ...	„ „ ...	„ „ ...	*
9	„ „ ...	84 „ ...	„ „ ...	0
10	„ „ ...	„ „ ...	„ „ ...	0
11	„ „ ...	112 „ ...	„ „ ...	0
12	6 „ ...	119 „ ...	„ „ ...	0
13	2 „ ...	150 „ ...	„ „ ...	0
14	6 „ ...	159 „ ...	„ „ ...	0

* A single trypanosome was found on each of two days.

The marked protection following the injection of living cultures suggested the possibility that vaccinated rats would be equally protected against natural infection by the flea or louse. The number of parasites present in the test dose of blood must be considerably larger than could be introduced through the agency of a biting insect. The white rat used in the laboratory has not been found to harbour fleas, but is often heavily infected with lice. After two unsuccessful experiments

"ten rats were first injected each with two cultures and after ten days, five of these were tested and found to be immune. The remainder, together with five clean and eight lousy, infected rats, were confined in a small cage. Later five additional infected and lousy rats were added. Of the vaccinated rats four died on the 24th, 29th, 52nd, and 130th day, respectively, without at any time showing trypanosomes in their blood. Of the five clean controls, two died on the 61st and 106th day without becoming infected. The remaining three became infected on the 28th, 69th and 81st day. The fact that three out of five non-immunes and none of the vaccinated animals became infected would indicate that the living vaccine does protect against infection by the louse. Further tests, however, especially with directly transferred lice, will be necessary fully to establish this point."

Some experiments on the curative action of cultures were indicative of a marked inhibitory influence and pointed to the possibility of aborting an infection by repeated large doses of the vaccine.

The authors' summary is as follows—

"*Tr. lewisi* after cultivation for several years on rabbit blood agar medium becomes non-infective.

"Trypanosomes may appear in very small numbers in the blood of rats inoculated with such cultures but they are incapable of multiplication *in vitro* or *in vivo*.

"Rats which receive one or more injections of the living culture acquire a solid immunity which becomes apparent in about 10 days.

"The immunity produced by the living culture is lasting and probably persists through life.

"The immunity induced by the living vaccine is probably efficacious against the natural transmission through the flea and louse.

"The immunity is not due to soluble products, since plasmolyzed and filtered cultures are inert.

"This successful immunization against *Tr. lewisi* by means of a living vaccine renders it probable that like results may be obtained with the more strictly pathogenic trypanosomes. It may be added that encouraging results have already been obtained with *Tr. brucei*."

[This valuable paper should be consulted in the original.]

A. G. B.

Laveran (A.). **Essais d'Immunisation contre des Trypanosomes pathogènes.**—*Bull. Soc. Path. Exot.* 1912. Dec. Vol. 5. No. 10. pp. 877-882.

Laveran points out that attempts to immunise against the pathogenic trypanosomes by means of dead trypanosomes have hitherto given unsatisfactory results. Lately, Schilling on the one hand and Braun and Teichmann on the other have announced that they have succeeded in immunising various animals against several species of trypanosomes by modifying the technique employed by their predecessors. Laveran decided to repeat the experiments. In this paper he describes his attempts to immunise by Schilling's method and by sensitised trypanosomes.

Schilling used for his experiments *T. brucei* killed by tartar emetic. His technique is detailed. Laveran followed it closely, using *T. brucei* and *T. rhodesiense.* In attempts to immunise mice with *T. brucei* (Ferox of Ehrlich) he had very little success. The *T. rhodesiense* results were more satisfactory. He draws however the following conclusions:—(1) It is very difficult to immunise mice against *T. brucei* (ferox strain) by Schilling's method; of twelve mice which had each received five injections of trypanosomes killed by tartar emetic none became immune. (2) Immunity is obtained more easily with *T. rhodesiense,* but it is very transitory, like that observed in treated animals, and not like the durable immunity enjoyed by animals which have recovered spontaneously.

The results of the experiments with sensitised trypanosomes, *T. brucei* and *T. evansi*, were such as to show that there is little hope of success in the application of this method to the trypanosome infections.

A. G. B.

Trypanosoma rhodesiense.

Taute (M.). **Zur Morphologie der Erreger der Schlafkrankheit am Rovumafluss (Deutsch-Ostafrika).** [The Morphology of the Human Trypanosome from the Rovuma River District, German East Africa.]—*Zeitsch. f. Hyg. u. Infektionskrankh.* 1913. Feb. Vol. 73. No. 3. pp. 556-560. With 1 plate.

The author reports on the morphology of the trypanosome found by him in cases of sleeping sickness in the Rovuma province of German East Africa, on the boundaries of the Portuguese colony of Mozambique. He discusses the possibility of the epidemic being due to *Trypanosoma gambiense* from the north or north-west and considers it unlikely, having regard to the geographical situation and communications of Rovuma. *Glossina morsitans* is the tsetse of Rovuma. The clinical consideration of the cases, marked by little sleepiness in the ordinary sense of the word, high virulence and extraordinary resistance to atoxyl, suggested the probability of the parasite involved being *Trypanosoma rhodesiense*, Stephens and Fantham. Taute then investigated the trypanosomes of Rovuma from the morphological point of view, comparing them with the trypanosomes from the Tanganyika region, using subinoculations in long-tailed monkeys. He finds that the occurrence of posterior nuclear forms, as described by the discoverers, is very characteristic and states that, as this feature gives a definite differential diagnosis, it is immaterial whether *T. rhodesiense* be considered as a new species or as a very distinct variety of *T. gambiense.*

He contrasts the trypanosomes of Rovuma with those of Tanganyika—certified as *T. gambiense*—and his plate is arranged to bring out the contrasts. The Rovuma trypanosomes show the short stout forms, which, as the author says, are those described by Stephens and Fantham. Taute has seen similar forms in the blood of animals in Bruce's laboratory in British Nyasaland. He has never seen posterior nuclear forms in animals infected with

T. gambiense. The somewhat vacuolated appearance and rich granulation seen in some *T. rhodesiense* was also present in the Rovuma trypanosome. The slender and intermediate forms of *T. gambiense* and *T. rhodesiense* are almost identical. Amoeboid forms were found in the peripheral blood. Forms without flagella showed appearances of involution. The author concludes with the statement that the characters of the sleeping sickness parasite of Rovuma, as seen in the blood of apes, are those of *Trypanosoma rhodesiense.*

In a footnote the author notes the possibility of big game trypanosomes also possessing posterior nuclei. [As his paper is subscribed " Lubimbinu bei Amaramba, Portug. Ostafrika, 23 Aug. 1912," it is likely that Taute was unaware of the work of Kinghorn and Yorke, who showed that such game were reservoirs of ***T. rhodesiense.***]

H. B. F.

Werner (H.). **Ueber menschliche Trypanosomiasis mit Schlafkrankheitssymptomen aus Portugiesisch-Ostafrika, verursacht durch *Trypanosoma rhodesiense*, und über Lumbalpunktatsbefunde, insbesondere die Nonne-Apeltsche Phase I Reaktion, bei Schlafkrankheit.** [A Case of Human Trypanosomiasis with Sleeping Sickness Symptoms from Portuguese East Africa, caused by *Trypanosoma rhodesiense*, with an Account of Lumbar Puncture findings in Sleeping Sickness.] — *Deut. Med. Wochenschr.* 1913. Feb. 6. Vol. 39. No. 6. pp. 261-263.

This case was first diagnosed by Dr. Stannus in Nyasaland (see *Sleeping Sickness Bulletin*, Vol. 4, p. 266). The patient, an elephant hunter in Portuguese East Africa, came to England and was admitted into the Albert Dock Hospital, where he remained for a month (see *Journal of the London School of Tropical Medicine*, 1912, Dec., p. 92, and this *Bulletin* No. 5, p. 275). He was admitted into the Seamen's Hospital at Hamburg on September 21st 1912. It is noted that on admission his spleen was very large and that the axillary, inguinal, and crural glands were much swollen. There was marked hyperaesthesia, especially of the deep muscles, and tremor of the fingers and tongue. There was marked sleepiness; the patient went to sleep while he eat and while he talked to the physician. His speech was difficult to understand and his writing was ataxic. The urine contained pus. The trypanosome was studied by von Prowazek, who agreed that it was *T. rhodesiense.* The red cell count was 2,250,000; the leucocyte count 2,050. A differential count is given.

The patient was treated with atoxyl and tartar emetic injections. He rapidly became worse. Eight days before his death his eyesight began to fail, and in a short time he became almost completely blind. The sleepiness increased, and in the last few days sleep was unbroken. At this time also the glands became much swollen; in the left inguinal region they formed a tumour the size of a hen's egg. Lumbar puncture done two days before death gave a clear fluid, in which living trypanosomes could be demonstrated without centrifugation. Eighteen hours before death the

trypanosomes, which had resisted large doses of atoxyl and tartar emetic, disappeared spontaneously from the blood and did not reappear. Death occurred on October 6th. An account is given of the post mortem findings. Microscopic examination of the brain had not been made.

The author considers the interesting points of this case to be, the clinical picture, the behaviour of the trypanosomes to atoxyl and tartar emetic, the disappearance of the trypanosomes shortly before death, the lumbar puncture findings, and the blood findings. He draws special attention to the marked somnolence and to the increase of the gland swellings shortly before death. He states that the resistance of the trypanosomes to atoxyl and tartar emetic was absolute; these drugs did not produce even temporary reduction of the parasites. He would attribute the disappearance of the trypanosomes eighteen hours before death to saturation of the tissues with carbonic acid. He notes that there was no increase of eosinophiles, as has been noted by Schilling and Newham in other cases. He thinks it probable that the sleeping sickness focus in Portuguese East Africa is connected with the one on the Rovuma river on the German border, several hundred kilometres away.

Lumbar Puncture Findings.—Nonne's Phase I reaction proved positive. This reaction, which the author believes has not yet been tested in human trypanosomiasis, consists in the globulin of the puncture fluid being precipitated by a saturated solution of ammonium sulphate. The reaction is obtained when there are morbid changes in the central nervous system. Werner has tried this reaction in two other cases of human trypanosomiasis, in one case with positive, in the other with negative results. He notes that in the two positive cases there were clinical signs of changes in the nervous system. The lumbar puncture fluid of the present case was examined for bacteria; all the media to which it was added remained sterile.

A. G. B.

Bevan (Ll. E. W.) & Millington (T. G.). **Notes on a Strain of Human Trypanosomiasis and a Review of the Present Knowledge of the Human Trypanosomiasis of Northern Rhodesia and Nyasaland.**—*Jl. of Comp. Path. & Therap.* 1912. Dec. Vol. 25. No. 4. pp. 298-312. With 6 text-figures.

When it was announced by Kinghorn and Yorke that they had found *Trypanosoma rhodesiense* in 16 per cent. of buck in Northern Rhodesia it was thought that the Veterinary Department should take up again the study of this parasite as it might prove a danger to domestic live stock. A rabbit was therefore obtained which had been inoculated with the blood of a man who died at Livingstone of trypanosomiasis. This was Ellacombe's case, described in the *Sleeping Sickness Bulletin* (Vol. 4, p. 185), in which Kinghorn found posterior nuclear forms of trypanosomes. With this strain many animals were inoculated with results which are tabulated. For comparison Bevan's table of animals inoculated with the Armstrong strain is added (see *Sleeping Sickness Bulletin*, Vol. 3, p. 21) and Kinghorn and Yorke's table. The Armstrong strain,

as shown by Bevan, caused a remarkable oedema of the face in rabbits and sheep, illustrated by photographs in the present paper. This new virus did not cause this swelling. A search was made for the feature which Stephens and Fantham have stated to be the essential characteristic of *Trypanosoma rhodesiense*, namely, the occurrence among the short and stumpy forms of some having the nucleus on the posterior side of the blepharoplast. A table is given showing the results of daily counts of the blood of an infected rabbit and rat. No forms were found with the nucleus in the posterior quarter. [It is not possible to make out from the table how many trypanosomes were scrutinised.] Measurements of 500 trypanosomes were tabulated in the form of a chart; the authors were forced to the conclusion that the variations from day to day and in different species of host are so great that the results obtained are unreliable.

The points on which Stephens and Fantham laid stress in the separation of this organism are discussed. It is pointed out that if sixteen per cent. of buck may act as reservoirs of the virus it is surprising (a) that the majority of cases have been in males, seeing that women work in the fields and are more exposed to the bite of *G. morsitans*; (b) that the incidence of the disease appears to be associated with the main trunk roads; and (c) that there has not been a greater number of cases. Again it is surprising that among the many thousands of cattle which during the last few years have passed from Fort Jameson to Feira on the way to Southern Rhodesia none have become infected. These animals are all examined by officers of the Veterinary Department, but during the last seven and a half years no trypanosome having the characters of *T. rhodesiense* has been met with, nor have any of the attendants or herdsmen contracted the disease. With regard to the virulence it is not considered that the figures obtained by inoculation have much value for differential diagnosis, as after a series of passages of any strain through different hosts the periods may vary. Some experiments are given in which the serum from an infected sheep was injected into animals in the course of an infection with this virus; it seemed to delay the course of the disease.

A. G. B.

Trypanosomes of Game and Domestic Stock.

Kinghorn (Allan) & Yorke (Warrington). **Further Observations on the Trypanosomes of Game and Domestic Stock in North Eastern Rhodesia.**—*Ann. Trop. Med. & Parasit.* 1912. Dec. 30. Vol. 6. No. 4. pp. 483-493.

Reference is made to the former Report in which the trypanosomes found in game and domestic animals in the vicinity of Nawalia in the Luangwa Valley were described (see *Sleeping Sickness Bulletin*, Vol. 4, p. 321). Subsequent to this the headquarters of the Commission were removed to the Congo-Zambesi watershed. In this Report the complete results of the examination of big game, domestic stock, and small vermin in Rhodesia are described.

In the valley 127 head of game, comprising 19 genera, were examined and trypanosomes were found in 33. On the plateau 124 head, belonging to 16 genera, were examined and trypanosomes were found in 21. Details are shown in tables. In the valley the parasites were found by direct examination in 26 cases, a percentage of 20·4; on the watershed in 16 cases, a percentage of 13. It is noted that these are high figures for single observations. An analysis of the figures shows that in the valley at least 37·5 per cent., and on the plateau at least 23 per cent. of the local fauna examined were infected with the trypanosomes of man or domestic stock. The percentage infected with *T. rhodesiense* was in the valley 16, on the plateau 3·3. Had sheep and goats been available for inoculation many more buck would probably have been shown to harbour *T. vivax* and *T. nanum*, monkeys and rats being refractory to these species.

Tables show that different species of buck vary widely in their susceptibility. Trypanosomes were never found in zebra (22), buffalo (6), wildebeest (2), or bushpig (4); and only rarely in roan, hartebeest, puku, mpala, and warthog. The species most heavily infected were waterbuck, eland, bushbuck and kudu. These points again are brought out in tables. It is noted that kudu and bushbuck, and waterbuck to a less extent, are usually found in thick cover; the other antelope more often in open country. It is considered however that specific differences in the immunity enjoyed by the buck are probably of greater importance.

Tables show the species of trypanosome occurring in each animal. Double infections were not uncommon. All the animals shot appeared to be in perfect condition. In the valley two cows, four goats, and five dogs were examined for trypanosomes; on the plateau three goats. The species found in both antelope and in domestic animals were *T. pecorum*, *T. nanum*, *T. multiforme*, sp. nov., *T. rhodesiense*, *T. vivax*, *T. ingens?*, T. sp. (*montgomeryi?*). *T. rhodesiense* was found in one dog. Cattle and goats seem to have been scarce. To the suggestion that the small vermin might act as reservoirs of trypanosomes it is objected that many are nocturnal and are not subjected to the bites of *G. morsitans*. The authors examined 142 wild rats, 15 wild mice, wild rabbit, giant rat, squirrel, galago, one of each, and two genets, with negative results. Not a single case of infection with trypanosomes was found in 256 monkeys (*Cercopithecus pygerythus*) examined, though infections with filaria and *Plasmodium kochi* were common.

A. G. B.

Rodhain (J.), Pons (C.), Vandenbranden (J.), & Bequaert (J.). **Note sur les Trypanoses Animales du Haut-Katanga.**—*Bull. Soc. Path. Exot.* 1912. Dec. Vol. 5. No. 10. pp. 819-822.

During a stay at Elisabethville, Belgian Congo, one of the authors examined numerous domestic animals in the district of Katanga, some of them introduced from Rhodesia. *Glossina*

morsitans occurs in the country. The results of examination are shown in the following table.

Species of Animals examined.	Number of Animals examined.	Number of animals found infected with trypanosomes.			Percentage of animals infected with		
		brucei or *pecaudi.*	*congolense* or *pecorum.*	*cazalboui* (*vivax*).	*brucei.*	*congolense.*	*cazalboui.*
Mules ...	67	27	—	—	40·3	—	—
Asses ...	27	7	—	—	25·9	—	—
Oxen ...	10	—	2	7	—	20	70
Pigs ...	11	—	7	—	—	53·6	—
Goats ...	59	—	1	2	—	1·69	3·38
Sheep ...	110	—	—	2	—	—	1·81
Dogs ...	7	5	2	—	71·4	28·8	—

The table indicates the resistance of the Bovidae and smaller animals to trypanosomes of the *brucei-pecaudi* type and their susceptibility to *congolense* and *cazalboui* types. Dogs and mules suffer especially from a virulent infection of *T. brucei.* In these animals posterior nuclear forms may be seen. No case of trypanosomiasis was found among Europeans at Elisabethville.

In conclusion the authors point out that on the high ground in the south of the Katanga, where *Glossina morsitans* alone exists, this fly transmits the same three types of pathogenic trypanosomes as those found in the lower regions in the north of the province.

H. B. F.

Epidemiological.

Leger (André). **Un Petit Centre d'Endémicité de Maladie du Sommeil à Koulikoro, près Bamako, coïncidant avec des Gîtes Permanents à *Glossina palpalis*.**—*Bull. Soc. Path. Exot.* 1912. Dec. Vol. 5. No. 10. pp. 828-832.

Several cases of human trypanosomiasis were discovered amongst the native pupils of the Agricultural Station at Koulikoro in the French Sudan. Some of these had been there for many years. Other cases were seen in the native village. A careful inspection of the neighbourhood was made and *Glossina palpalis* was found at a ford on a much frequented stream where natives were accustomed to drink and wash. The banks of this stream have been cleared and the patients are undergoing treatment. It is considered that this small endemic centre will disappear.

A. G. B.

Ringenbach. **Contribution à l'Etude de la Distribution de la Maladie du Sommeil en Afrique Equatoriale Française (Pays Bakongo, Bakongui et Loango) Mai-Juin-Juillet 1912.**—*Bull. Soc. Path. Exot.* 1913. Jan. Vol. 6. No. 1. pp. 34-40.

The author was instructed to make a medical inspection of the country between Loango and Brazzaville in the south of the

French Congo. Between these two places it is proposed to make a railway. Tables are given showing the result of the examinations for human trypanosomiasis. 92 cases were found among 3,048 natives examined. In one village, of 82 persons examined 16 were found to be infected. Many of these were related. This is considered to support the hypothesis of family infections which was formed by the French Commission in 1907 (see *Sleeping Sickness Bulletin*, Vol. 1, p. 70). *Glossina palpalis* was found on the streams all along the route, together with other biting flies. The paper is illustrated by a sketch map.

A. G. B.

Schwetz (J.). **Les Glossines et la Maladie du Sommeil dans la Vallée de la Lukuga.**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1913. Jan. Vol. 17. No. 2. pp. 37-54.

The contents of this paper correspond in most respects with that of another noticed in this *Bulletin* (No. 1, p. 56). It is stated in addition that trypanosomes were found in two natives living in the Lukuga Valley. There are two illustrative sketch maps.

A. G. B.

Southern Rhodesia.

According to a despatch from Dr. A. M. Fleming, Medical Director, Southern Rhodesia, dated November 29th, 1912, ten cases of trypanosomiasis had been found at that date in the Sebungwe district of Southern Rhodesia. The first case was a European, H. R. T. (see this *Bulletin* No. 5, p. 275) who was taken ill in March 1912 and died the same year in London. The other cases, all in natives, were found by Dr. F. O Stohr. All the patients had visited or resided in the valley of the Busi river, where *G. morsitans* is prevalent. This part of the country is thinly populated and remote from a European settlement. The natives are to be moved out of the fly area which is not extensive.

A. G. B.

American Trypanosomiasis.

Dias (Ezequiel). **Die Krankheit Carlos Chagas. Haematologische Studien.** [Haematological Studies in Chagas' Disease].—*Memorias do Instituto Oswaldo Cruz.* 1912. Vol. 4. No. 1. pp. 34-61.

The author met with great difficulty in the selection of cases for his researches because so many of the patients with ' parasitic thyroiditis ' suffered also from ankylostomiasis and malaria. After selecting his cases from a part of the country where there was no malaria he was obliged to eliminate 38 of 57, mainly owing to the presence of ankylostomes and other entozoa. 19 pure cases alone remained. More than 54 per cent. of the sufferers from this disease have also ankylostomiasis. An account of the technique is given; the corpuscles were counted by Thoma-Zeiss, the haemoglobin estimated by Fleischl. The blood figures for normal

persons at Rio de Janeiro—men, women, and children—as obtained by the author in 1903, are given. It is noted that the haemoglobin percentage is less than that of other authors.

Of the nineteen patients one only had an acute infection, six showed the pseudomyxoedematous form, seven the cardiac form, three the nervous form, and two infantilism. In the acute case it is noted that the polynuclears were 12·8 per cent. and the large lymphocytes 59·02 per cent. This macro-lymphocytosis at the expense of the neutrophiles seems to be typical of the acute infection. Details are given of the blood findings in the other classes of cases, and again when the cases are classified as men, women, and children.

When the author began the enquiry he expected to find very marked changes in the blood. In the sequel he was surprised to find how small the changes were. With regard to anaemia, even in the children the red corpuscles exceeded 5,000,000; the haemoglobin was 50 per cent., a 'slight degree' of oligochromaemia. He notes that *Trypanosoma cruzi* is less a parasite of the blood than of the tissues. It appears that only in the acute form is there leucocytosis; after the acute stage it is seldom seen.

As to the leucocyte formula, at the early stages of the disease there is a considerable macro-lymphocytosis, with a slight micro-lymphocytosis; later there is a gradual decrease of lymphocytes and a proportionate increase of neutrophiles, eosinophiles, and mast cells. The following table illustrates these points:—

—	Small lympho-cytes.	Large lympho-cytes.	Poly-nuclear neutro-philes.	Poly-nuclear eosino-philes.	Mast cells.	Eosino-phile myelo-cytes.
	%	%	%	%	%	%
Acute infection ...	20·08	59·02	12·8	0·2	0·1	—
Recent cases ...	26·1	33·0	30·7	5·4	0·4	0·33
Pseudomyxoede-matous form.	14·4	30·7	40·5	9·6	0·3	0·08
Nervous form ...	19·7	24·1	38·4	11·3	0·8	0·06
Cardiac form ...	13·09	19·07	55·3	7·5	0·4	0·02

With respect to this table it is noted that the pseudo-myxoedematous and nervous forms were in children who could not have been very long infected, whereas the cardiac forms were in adults whose infection probably went a long way back.

Lastly, a comparison is made with the conditions found in sleeping sickness. The author takes the figures of Greig and Gray, preferring them to those of Low and Castellani or of Martin, Leboeuf and Roubaud, because Greig and Gray seemed to him to have selected cases free from ankylostomiasis, filariasis, and malaria. Greig and Gray found that there was no anaemia, that lymphocytosis was constant, and that the mast cells and eosinophiles were increased. With regard to their finding that on the approach of death the number of red cells went up, this

was not shown to be the case in Chagas' disease. The following are the conclusions:—

1. In Chagas' disease there is, as a rule, no globular anaemia; there is always a definite decrease in haemoglobin and in the specific weight of the blood.
2. Leucocytosis, slight in acute cases, is exceptional in the chronic form.
3. In the acute infection and in fresh cases there is a marked macrolymphocytosis at the expense of the polynuclears.
4. In cases of long standing one finds usually eosinophilia, slight basophilia, and the occurrence of eosinophile myelocytes.
5. The haemoleucocyte formula of Chagas' disease is very similar to that of sleeping sickness.

The paper closes with details of each case observed.

[Greig and Gray examined the blood and tabulated their results in the case of 57 natives with sleeping sickness at Entebbe. It is, however, very doubtful whether they excluded cases infected with malaria, entozoa, or filariae. In those parts of Uganda where sleeping sickness infection is contracted, especially on the shore of the Victoria Lake, all these infections are extremely common, and it is doubtful whether any native case of human trypanosomiasis could be found at Entebbe which would not show one or more of the above conditions. It is therefore open to doubt whether Dias' figures are comparable with those of Greig and Gray].

A. G. B.

Guerreiro (Cezar). **Urologische Untersuchungen bei der Krankheit von Carlos Chagas.** [Urological Investigations in Chagas' Disease].—*Memorias do Instituto Oswaldo Cruz.* 1912. Vol. 4. No. 1. pp. 66-74.

These observations refer to 31 cases of American human trypanosomiasis of different clinical forms, none being acute. Details of the methods employed in the analyses are given. The forms investigated were the cardiac, the nervous, the chronic, and two cases of infantilism. The conclusion is that in this disease a slight degree of liver insufficiency occurs, as well as insufficiency of other glands. It was present in all the forms investigated except in the pure cardiac form. In chronic forms of long standing the liver insufficiency seems to be still more marked. Tables are given.

A. G. B.

Blanchard (M.). **Généralités sur la Trypanosomiase Américaine.**—*Ann. d'Hyg. et Méd. Coloniales.* 1912. Oct.-Nov.-Dec. Vol. 15. No. 4. pp. 772-780.

The author gives an account of the discovery of American trypanosomiasis and of the parasite *Schizotrypanum cruzi.* The symptoms are briefly described under the headings—acute cases; chronic cases, with five forms: *viz.* pseudomyxoedematous, myxoedematous, cardiac, nervous, chronic with acute exacerbations; and thirdly, the 'meta' affections, infantilism, cretinism, goitre, etc. The outlines of the pathological anatomy are given.

A. G. B.

MISCELLANEOUS.

LAVERAN (A.) & MESNIL (F.). **Trypanosomes et Trypanosomiases.** 2nd Edition. pp. viii. + 1000, 198 text-figures, and 1 coloured plate. 1912. Paris: Masson et Cie. [25 fr.]

In the introduction to this book, dated October, 1912, the authors note that in 1892 it was possible to sum up our knowledge of the trypanosomes in an article of 12 pages. In 1904 they wrote a book of 418 pages on the same subject and the present volume contains no less than 999 pages. This edition is therefore more than double the size of the last and is little less than double the size of the English edition by NABARRO (1907). It is divided into a General part containing 248 pages, and a Special part, the rest of the book. The greater portion of the first part is new. In the Special part sleeping sickness, including *T. rhodesiense* infection, receives 120 pages and there are new chapters for the African trypanosome infections caused by *T. togolense*, *T. soudanense*, *T. cazalboui*, *T. congolense*, *T. pecorum*, *T. nanum*, *T. pecaudi*, the trypanosome infections of equines of Central America and the human infection caused by *Schizotrypanum cruzi*. The trypanosomes of invertebrates have a chapter, and lastly, there is an appendix on the invertebrate transmitters. This edition contains 148 text figures as against 81 in Nabarro's edition. It may be noted that a figure by BRUCE and his collaborators showing the development of *T. vivax* in *G. palpalis* appears with the label *T. cazalboui*. Another figure shows the pulmonary cysts which CARINI associated with *T. lewisi;* from DELANOE'S recent work it is probable that these cysts have nothing to do with the trypanosome. No one who is concerned with trypanosome research or practice in trypanosome affected countries can afford to be without this book. Unfortunately it lacks an index, hardly compensated for by the table of contents.

A. G. B.

NUTTALL (G. H. F.). **The Herter Lectures. II. Trypanosomiasis.** —*Parasitology.* 1913. Jan. Vol. 5. No. 4. pp. 275-288.

This lecture was delivered at the Johns Hopkins University, Baltimore, Maryland, U.S.A., on October 9th, 1912. After a general discussion of the subject the author considers in turn Sleeping Sickness; Nagana; Some other Glossina-transmitted trypanosome infections; Chagas' disease; *Trypanosoma boylei*, Lafont; The rat trypanosome and its mode of transmission; Leech-transmitted trypanosomes of fish, reptilia and amphibia; and Powers of adaptation shown by trypanosomes. He concludes with a few words on preventive measures. With reference to the differentiation of species he writes:—

"In some cases, morphological characters sufficiently differentiate the species, but our confidence in some of these characters has been shaken since we know that a species of trypanosome may alter its appearance in changing its host. Whereas the immunity reactions have been used to differentiate species of trypanosomes, a means of distinguishing species to which no zoologist will agree, we now know that this means of differentiation cannot be relied upon since the virulence (an obscure character) of the parasites can be considerably modified experimentally."

With regard to the reservoir question he writes:—

"The wide range of pathogenicity possessed by *T. gambiense* renders it certain that it must, in nature, find reservoirs in other animals than antelope . . . Birds, reptiles and amphibia appear to be immune."

[The last sentence is not strictly correct, as fowls have been infected with *T. gambiense* (see *Sleeping Sickness Bulletin*, Vol. 4, p. 277).]

The lecture is well worth perusal.

A. G. B.

Newstead (R.). **On the Characteristics of the Newly Discovered Tsetse-fly, *Glossina austeni*, Newstead; with Descriptions of the Genital Armature of *Glossina fuscipleuris*, Austen, and *Glossina longipennis*, Corti.**—*Bull. Entom. Research.* 1912. Dec. Vol. 3. No. 4. pp. 355-360.

Newstead writes that of the species possessing dark hind tarsi the only one that *G. austeni* can possibly be confused with is *G. tachinoides*. The former may be distinguished at once by its narrower front and also by the bright colour of the abdomen and the presence of the dark lateral stripes on the thorax. In the original description he said that *Glossina austeni* bore a somewhat close resemblance to a dwarfed specimen of *G. fusca*; now that he has examined a larger number he says that the general colour of the abdomen is most like that of *G. longipennis*. A description of *G. austeni* is given. Mr. Filleul, who found the specimen that forms the type of this species, writes that it is found in Jubaland together with *G. pallidipes* and *G. brevipalpis* within half a mile of water. It is considered by the natives to be deadly to cattle. The editor states that besides specimens from the Juba river he has received this species from Portuguese East Africa.

There are figures of the male armature of the three species named in the title. Newstead writes that *G. fuscipes*, Newst. described as a distinct species must sink as a well-marked race of *G. palpalis*.

A. G. B.

Boycott (A. E.) & Price-Jones (C.). **Experimental Trypanosome Anaemia.**—*Jl. Pathology & Bacteriology.* 1913. Jan. Vol. 17. No. 3. pp. 347-366.

The authors' observations have been made on rats and rabbits infected with nagana (*T. brucei*). The rats developed a well-marked septicaemia and died in three to eight days. No anaemia was found in them. Rabbits on the other hand became anaemic more or less quickly in nearly every instance. Most of the animals were killed for experimental purposes. Death seems to occur naturally in four to six weeks. Four types of the general course of the illness are shown graphically in figures. The fall in the haemoglobin percentage is most commonly fairly rapid; the haemoglobin reaches a point of about 60 per cent. of the normal figure in about fourteen days and remains at approximately the same level for perhaps two or three weeks. The body weight usually remains approximately unaltered for two or three weeks

and then falls rather quickly. These points are shown in tables. In fourteen animals the total quantity of circulating haemoglobin and the blood volume were determined. It was evident that at least five had a good deal too little haemoglobin. The greatest rate of destruction was about ten per cent. per day.

The most obvious feature in stained blood films was the relative absence of signs of regeneration. In some instances the red cells appeared to be entirely normal. The whole picture was different from what is seen during active regeneration either after haemorrhage or after blood destruction; it seems clear from the films that blood regeneration is either much depressed or takes an abnormal course. This conclusion was confirmed by the examination of the marrow, the details of which are given in tables. In six out of nine rabbits there was little or no evidence of erythroblastic activity. It is concluded that the response of the marrow is defective, not because the stimulus is inadequate, but because the nature of the infection exercises some inhibitory effect on the generation of red cells. No systematic observations were made on the leucocytes; it was, however, noticed that the anaemic animals generally had a leucopenia, corresponding with the inhibition of marrow activity. The only uniform feature in the differential counts was the excess of large mononuclears, natural to a protozoal infection. The normal figure for rabbits being four or five per cent., in the infected animals it often reached ten to fifteen per cent. The same change was shown in the marrow counts. In the ears of infected rabbits, especially in association with the pricks made to obtain samples of blood, curious oedematous patches developed. In the juice expressed from these trypanosomes were found abundantly, while the patches themselves and the immediately surrounding tissues were packed with leucocytes, almost exclusively finely granular oxyphil cells.

It is not clear to the authors how far the anaemia of the animals may be due to the imperfect marrow activity. There is evidence however that active blood destruction goes on. The lymphatic glands all over the body are distinctly enlarged and often congested. In such glands there is more or less phagocytosis of the red cells by the endothelial cells; the process seems to be more active in the peripheral than in the mesenteric glands. The organs gave a more or less pronounced reaction for free iron, as shown in tables. In the disintegration of red corpuscles after phagocytosis the cells break up into more or less spherical granules, but enough of this pigmented material was never found to account for the amount of phagocytosis which is commonly seen. What seems to happen is that the remains of the red blood cells are transported to the liver and spleen where they undergo further decompositions. This is probably the origin of red cells inside leucocytes (? endothelial cells) in the peripheral blood in human cases of malaria and trypanosomiasis (Connal). The authors believe that when red cells are injured so that they will shortly dissolve in the circulation they are taken up by phagocytic cells. They do not think that in the red cell destruction there is any direct action of the parasites, since these were exceedingly sparse. They could obtain no evidence

that the trypanosomes were haemolytic *in vitro*. The summary is as follows: —

"Rabbits infected with *Trypanosoma brucei* became anaemic owing to the destruction of red cells by phagocytosis in the lymphatic glands. The response of the marrow is generally defective, and the anaemia is therefore persistent. The iron of the destroyed haemoglobin is stored in the liver and spleen."

A. G. B.

Nattan-Larrier (L.). **Contribution à l'Étude de l'Action de la Bile sur les Trypanosomes.**—*Bull. Soc. Path. Exot.* 1913. Jan. Vol. 6. No. 1. pp. 24-28.

The author, after briefly mentioning the work of other investigators, summarises the experiments performed by him during 1911. He used the strain of *T. brucei* which was blepharoplastless (Werbitzki strain). The inoculated animals, usually mice, were killed when the trypanosomes were very numerous. The blood was citrated and centrifuged. The layer containing trypanosomes was collected and added to physiological saline solution. The mixture was centrifuged again. After decantation an equal quantity of physiological saline was added to the bottom layer. The bile used was obtained fresh from oxen in most cases and was filtered through a Chamberland filter. Occasionally desiccated bile was used after being dissolved in salt solution. Details of experiments are given on (a) the action of bile on trypanosomes, (b) treatment with bile, and (c) attempts at immunization.

In his conclusions the author states (1) that he found bile to be trypanolytic, (2) that the subcutaneous inoculation of filtered bile or of desiccated bile in solution has no curative action on *T. brucei*, and (3) that the inoculation of emulsions of trypanosomes treated with bile does not confer immunity on mice.

H. B. F.

Oehler (R.). **Ueber die Gewinnung reiner Trypanosomenstämme durch Einzellenübertragung.** [Pure Trypanosome Strains obtained by Transmission of Single Trypanosomes.]—*Centralbl. f. Bakt.* 1 Abt., Orig. 1913. Jan. 23. Vol. 67. No. 7. pp. 569-571.

Oehler considers that all cultures, to be pure, should be the descendants of a single, isolated, individual cell. Such pure cultures have long been in use by workers on fungi and yeasts. "Pure" strains of trypanosomes in laboratories are not really pure cultures, in that the organisms are not descendants of one single trypanosome only. Oehler describes a method whereby a single trypanosome can be isolated and then inoculated into an animal such as a mouse, when a pure culture could be obtained. Full details are given of his method which can only be shortly summarised here. (1) Blood containing trypanosomes is either diluted with salt solution in capillary tubes until the trypanosomes are sufficiently far apart to enable them to be isolated, or the blood is centrifuged. Great care is needed to prevent adhesion of trypanosomes to the capillary tube in the first case, while the

organisms often are deformed by the centrifuge. (2) Isolation of the single trypanosome is effected by cutting out the portion of glass tube containing it, the capillary being under observation under the microscope, and thus the entity of the trypanosome being known. This is a delicate operation. Capillary tubes of ·02 mm. bore and ·01 mm. wall thickness are recommended. (3) Inoculation of the single trypanosome is effected by the transference of it in the portion of glass tube to the needle of a hypodermic syringe and injecting either intravenously or subcutaneously. Ten cases out of 31 succeeded, four different strains being employed. The trypanosomes were visible in four to six days. The incubation period was not prolonged.

Oehler thinks, as a result of his work with such pure cultures, that serum-fast and arsenic-fast strains of trypanosomes are to be regarded as cell variations and not as evidence of selective power. He suggests that by this method it may be possible to decide whether in natural infections pure or mixed infections are present.

H. B. F.

Beltzer (A. W.), Kohl-Yakimoff (Nina), & Yakimoff (W. L.). *Trypanosoma equiperdum* **en Russie d'Europe.**—*Bull. Soc. Path. Exot.* 1912. Dec. Vol. 5. No. 10. pp. 822-825.

Dourine is wide-spread in Russia. The authors record the geographical distribution and the difficulty of trypanosome diagnosis, as well as the measures taken by the Russian Government and veterinarians to cope with the disease. Miessner of Bromberg first found *Trypanosoma equiperdum* in 1909 in an infected horse of Russian origin. A little later Zwick and Fischer isolated the trypanosome from dermal plaques and they were able to infect laboratory animals. Beltzer first isolated the trypanosome in Russia at Riasan. The morphology and measurements of the flagellate are discussed in detail, and compared in a table with the measurements of the organism given by other observers in various parts of the world. The authors consider that there is "biological identity" between the various specimens of *T. equiperdum* from different sources.

H. B. F.

Biot (R.) & Richard (G.). **De la Possibilité d'Inoculer le** *Trypanosoma lewisi* **à d'autres Animaux que les Rats.**—*Bull. Soc. Path. Exot.* 1912. Dec. Vol. 5. No. 10. pp. 826-827.

Details are given of the successful inoculation of *Trypanosoma lewisi* from the heart-blood of white rats into three jerboas (*Bipus gerbo* from Tunis). The incubation periods were 5, 20 and 4 days respectively. One of the jerboas died in 8 days, after exhibiting prostration, petechiae on the thorax and actual haemorrhages. When *T. lewisi* from the jerboa was inoculated back into the rat there was "no modification in the evolution of the parasite."

A dormouse (*Myoxus nitela*) was successfully inoculated with *T. lewisi* from the blood of one of the jerboas afore-mentioned.

Trypanosomes were seen in the blood of the dormouse next day. The animal died at the end of the seventh day after inoculation, after exhibiting prostration, dyspnoea, irritability and often somnolence.

The authors conclude that *T. lewisi* is not so limited to rats as was at one time supposed, and in certain circumstances (as in the jerboa and dormouse) the virulence of the parasite seems susceptible of increase.

H. B. F.

Roudsky (D.). **Sur un Corpuscle Temporaire de *Trypanosoma lewisi* et de *Tr. duttoni*, simulant à Certaines Phases de son Evolution, un Deuxième Noyau.**—*Compt. Rend. Soc. Biol.* 1912. Dec. 27. Vol. 73. No. 37. pp. 730-732.

The author deals with *Trypanosoma lewisi* in mice and *T. duttoni* in rats; that is, the trypanosomes were living in animals other than their natural host.

Under certain conditions, not yet fully understood, a round corpuscle occurs in front of, or by the side of the blepharoplast. This corpuscle stains red with Giemsa, but somewhat less deeply than the nucleus. This new structure is three or four times the size of the blepharoplast. It contains fine basophile granulations lying in a basophile sap. Its volume increases simultaneously with the condensation of the granules to form a pseudo-karyosome. Later the granules arrange themselves at the periphery of the corpuscle and simulate "chromosomes," while the centre of the body contains a very few fine granulations. In the end all the granules disappear and thus a large round homogeneous vacuole is produced. In one case only, a homogeneous mass staining like the cytoplasm occupied the position of the corpuscle. The author wonders whether this is the final stage in the evolution of the corpuscle, which has then changed its chemical and staining reactions.

The trypanosomes in which the corpuscles occur have markedly elongate posterior extremities. They have never been seen in dividing trypanosomes, nor have they been found in *T. lewisi* when in the rat, nor in *T. duttoni* in the mouse.

Roudsky asks whether the formation of the corpuscle may be a function of the change of host. The paper is illustrated by six text-figures.

H. B. F.

YAWS.

Kerr (William M.). **A Report on the Prevalence of Framboesia (Yaws) in Guam, and its Connection with the Etiology of Gangosa.**—*U.S. Naval Med. Bull.* 1912. Oct. Vol. 6. No. 4. pp. 549-552.

The author investigated the incidence of yaws in certain districts of Guam by a house to house canvass and found that 73·8 per cent. of the natives examined had had the disease. He then examined the records of 315 cases of gangosa and found that 85 per cent. of these patients had had yaws in the past, and many of them gave a positive Wassermann reaction.

He concludes as follows—

"(*a*) That yaws is exceedingly common in Guam.

"(*b*) That yaws is an antecedent factor in gangosa.

"(*c*) That yaws is responsible for the positive [Wassermann] serum reactions which have been obtained in gangosa, leprosy, and other diseases in Guam as well as in apparently normal natives.

"(*d*) That yaws in the different households in Guam explains the apparent family relationship which has been reported as occurring in gangosa and the positive serum reactions which have been obtained in blood relatives (brothers and sisters) of those afflicted, showing no lesions of gangosa."

A. Castellani.

Degorce (A.). **Un Cas de Pian avec Roséole Papuleuse.**—*Bull. Soc. Méd.-Chirurg. de l'Indochine.* 1912. Nov. Vol. 3. No. 9. pp. 617-619. With 2 photographs.

The author briefly describes a case of yaws in a native from the Province of Ha-dông, Indochina, in which the whole body was covered with a syphilitic papular roseola, in addition to the typical lesions of yaws. There was no evidence of any syphilitic infection and the author regards the roseola as one of the manifestations of yaws. The paper is accompanied by two plates illustrating the condition.

E. Hindle.

Harper (P. H.). **Report on the Treatment of Fijian Yaws and Syphilis in Indians by "606" in 1911. Fiji.**—Received in Colonial Office, November 27, 1912.

During a period of four months, 36 cases of yaws and 15 of syphilis have been treated at the Colonial Hospital, Suva, by means of injections of salvarsan. A 1 in 10 aqueous solution of the drug was employed and the injections were made intravenously, intramuscularly and subcutaneously respectively. In addition, three cases were treated by the injection of serum from a treated patient.

In one case the intravenous injection of 0·6 gm. of the drug was followed by the death of the patient. This was a female Fijian, about fifty years old, who had suffered for many years from a chronic yaws ulcer of the breast. As she also presented a chronic yaws cachexia the author administered a full dose and the

patient died five days later. Death is supposed to have been due to an overdose of the drug and the author considers that 0·2 gm. would have been a more suitable dose.

Four other cases were also more or less unsuccessful: (1) An adult male Indian suffering from syphilis was treated with a subcutaneous injection of 0·4 gm. of salvarsan. Nine days later he was apparently cured but was given another subcutaneous injection of 0·3 gm. before being discharged. Seven weeks later he returned with syphilitic ulceration of the nasal septum. Later the salvarsan had to be removed by incision from both the injection areas.

(2) An old Fijian woman with tertiary yaws of the nose and palate, and a deep ulcer on the side of the tongue. She was injected intravenously with 0·2 gm. of salvarsan and half an hour later had a rigor. Later her condition improved and 0·3 gm. were injected intramuscularly. About three weeks later the patient left hospital. Her general condition was much improved and the ulcer and growth were cleaner and smaller. The growth might have been a carcinomatous condition supervening on chronic yaws irritation.

The remaining two cases described as failures were only injected with the serum from other treated cases and both gave more or less doubtful results.

The author remarks that the drug does not appear to have a selective influence on any of the races treated. The greater liability of Fijians to albuminuria following intravenous injections is only apparent and is considered to be due to the fact that yaws is a more severe disease than syphilis.

The treatment of yaws by salvarsan is very economical, for before its introduction the average stay in hospital of yaws patients was over 45 days, whereas after salvarsan was employed this period was reduced to less than 20 days.

E. H.

Koch (C. A.). **Ueber Frambösieheilung durch Salvarsan.** [Treatment of Framboesia by Salvarsan.] — *Berlin. Klin. Wochenschr.* 1912. Dec. 30. Vol. 49. No. 53. pp. 2483-2485.

The author briefly discusses the relation of yaws to syphilis with especial reference to the clinical features of the disease in Surinam (Dutch Guiana). He points out that although the two are very similar there are certain differences which serve to distinguish them. Thus the primary lesion of yaws is very rarely situated on the genital region but commonly on the foot, and moreover it is usually transmitted by contact with objects that have been soiled by the secretions from a suppurating yaws pustule.

In Surinam the blacks are nearly all infected and one of the reasons which conduces to the spread of the disease is the practice of the natives of selling their clothes for a few centimes before entering the hospital.

The author has tested the effect of injections of salvarsan on over 2,000 patients, and the results have been so favourable that at the present time the hospital is free from any cases of yaws. Adults were injected with 0·4-0·6 gms. of the drug administered intravenously. From the sixth day the ulcers began to disappear and after a fortnight the majority of the patients were cured, with the exception of 0·5 per cent. of the cases which required a second injection. The article is accompanied by six figures illustrating the effect of the treatment on the surface lesions of the disease.

E. H.

Mouchet (R.) & Dubois (A.). **Le Traitement du Pian et de la Syphilis par le Salvarsan dans la Pratique Indigène.**—*Bull. Soc. Path. Exot.* 1913. Jan. Vol. 6. No. 1. pp. 14-19.

The authors state that syphilis is common at Leopoldville, while yaws is frequently met with in every part of the surrounding districts. They have often seen in yaws patients peculiar nodules in the proximity of the articulations and consider the condition to be Jeanselme's "juxta-articular nodules." The natives believe that the condition is a late manifestation of yaws and the authors suggest that researches should be carried out on the subject. The authors have used salvarsan extensively in both syphilis and yaws with extremely good results; they prefer an alkaline solution to an acid one, and advise a dose of 0·01 gm. of the drug per kilogram of weight. [The condition known as Jeanselme's juxta-articular nodules is due to a fungus: *Nocardia carougeaui* Brumpt 1910; it is to be noted, however, that in Africa nodules induced by *Filaria volvulus* may closely simulate it.]

A. C.

Brochard (V.). **Dix Cas d'Administration du "606" par la Voie Buccale.**—*Bull. Soc. Path. Exot.* 1913. Jan. Vol. 6. No. 1. pp. 20-22.

The author first experimented on himself by taking 0·10 gm. of salvarsan dissolved in 1 cc. of soda solution to which 100 cc. of water was added. No untoward symptom having resulted, he administered the drug in the same manner but in larger doses (0·40-0·50 gm.) to nine patients suffering from yaws, with very good therapeutic results. The drug should be administered on an empty stomach and the patient should not touch food for two hours. The author considers this method to be a useful one for children.

A. C.

DESTRUCTION OF BITING ARTHROPODS AND TICKS.

Bourret (G.). **La Désinfection Antimoustique au Moyen de la Quinoléine.**—*Bull. Soc. Path. Exot.* 1912. July. Vol. 5. No. 7. pp. 556-561.

Legendre (J.). **De la Désinfection Culicidienne par la Quinoléine.** —*Ibid.* Nov. No. 9. pp. 739-744.

Both these papers have to do with investigations on the destruction of mosquitoes by means of quinoline. When this substance is vaporised over a lamp, in quantities of half a gram for every cubic metre of space, in rooms under natural conditions, with no special precautions to obliterate apertures, all mosquitoes are killed in two hours. Probably the toxicity would be even greater if the quinoline was volatilised. Its use is simple and requires no special apparatus. It evaporates without taking fire and there is no smoke. The disadvantages lie in the cost and the disagreeable and persistent odour accompanying its use. The authors find that the toxicity is greater than that of the crésyl recommended by Bouet and Roubaud (*see* below).

C. M. Wenyon.

Bouet (G.) & Roubaud (E.). **Expériences de Désinfection Stégomycide par le Crésyl.**—*Bull. Soc. Path. Exot.* 1912. Oct. Vol. 5. No. 8. pp. 627-633.

Experiments were conducted to test to what extent the agents commonly employed (sulphur, formol, pyrethrum powder) in the destruction of mosquitoes in habitations were reliable. Cages of muslin containing mosquitoes (*Culex, Stegomyia, Urranotaenia*) were placed in various parts of a room of 43 cubic metres capacity, all apertures of which had been carefully occluded. Some of the cages were suspended from the wall, others were placed on the floor while some were enclosed in loose meshed osier baskets. The temperature in the room was below 25° C. Two types of formol apparatus were employed, viz.—the "Fumigator Gonin" and the "Hélios." As a result of the experiments, details of which are given, the authors conclude that formol is not a sufficiently powerful culicide. The results obtained with the "Hélios" apparatus were slightly superior to those with the "Gonin." The cost of such disinfection becomes as high as 18 francs per 100 cubic metres.

Similar experiments were conducted by fumigation with pyrethrum powder, but the results were far from satisfactory. Fumigation with tobacco (10 grams per cubic metre), as used with success by Bourret and d'Anfreville in Saint-Louis, gave good results but the cost (3 francs per 100 cubic metres) and the unpleasant nature and persistence of the fumes renders this an undesirable agent. Mixtures of tobacco and pyrethrum powder (1 part tobacco to 3 parts of pyrethrum), used in a quantity of 5 grams per cubic metre of space to be disinfected, gave good results and were less disagreeable.

The experiments were extended and after trying camphor, phenol, quinoline, creosote, etc., the authors discovered that crésyl gave very good results when evaporated in an iron pan over a flame. When evaporation was nearing completion a grumous residue was left and this was liable to take fire and produce abundance of black fumes if the pan was allowed to be too near the flame. This can easily be avoided by the use of suitable iron pans (16 cm. high by 35 cm. broad) with sides high enough to prevent the residual mass coming in contact with the flames beneath. Heating can be carried out by means of an alcohol lamp or Primus burner. The experiments were carried out with great care and natural conditions were exaggerated by wrapping the cages in clothes and enclosing them in baskets. It was found that the penetrating power of Crésyl, 5 c.c. per cubic metre of space with exposure of 3 hours, was superior to sulphur in a quantity of 10 grams for 5 hours exposure. The authors believe that for the following reasons this agent will be of great service in the future:—1. Crésyl (or its derivatives creline, creoline, lysol) can be obtained easily in all the colonies in case of epidemics. 2. The cost is low, francs 0·30 for 100 cubic metres, requiring 5 grams per cubic metre. 3. The vapour is inoffensive and individuals can enter the rooms during the disinfection. 4. The fumes do not injure metal and other materials. 5. There is no persisting disagreeable smell afterwards. 6. The fumes are sufficiently dense to act efficaciously in imperfectly closed apartments.

The authors have found that cresol and cresylic acid may be substituted and that these products have the advantage of leaving no inflammable residuum. The action on mosquitoes and house flies in doses of one gram per cubic metre is quite as good as that of crésyl in doses of 5 grams. The cost works out at over twice that of crésyl and the authors believe that the much more easily obtained crésyl will be found to be more practicable.

C. M. W.

Thiroux (A.). **De la Destruction des Moustiques Adultes dans les Locaux Mal Clos et en particulier dans les Barraques en Bois.**—*Bull. Soc. Path. Exot.* 1912. Oct. Vol. 5. No. 8. pp. 633-637.

The author has tested the action of tobacco as a culicide when employed on buildings which cannot be effectually sealed to prevent escape of fumes or mosquitoes—as for instance those with walls of wooden planks badly fitting together and with thatched or tiled roofs with numerous apertures. The experiments were conducted in two such buildings each of a capacity of 24 cubic metres, one of which was covered completely with an impermeable tent well fixed down at the sides in the sand. In each case 480 gms. of tobacco were burned in a charcoal fire for two hours and mosquitoes were exposed in cages in various parts of the buildings. In one experiment, conducted on a day when there was little wind, all the mosquitoes were dead in both houses. On a second occasion on a windy day many of the mosquitoes in the uncovered building escaped, especially those in cages on the wind-

ward side, but in the covered building all were killed. It is thus clearly demonstrated that the covering of such buildings with an impermeable tent is the only means of effectually destroying all the mosquitoes, so that the author considers that the sanitary service in Senegal should be supplied with about ten such tents, to be used in the destruction of mosquitoes.

C. M. W.

D'Anfreville (L.). **La Lutte contre les Moustiques à Saint-Louis du Sénégal.**—*Bull. Soc. Path. Exot.* 1912. Oct. Vol. 5. No. 8. pp. 637-640.

This paper records the results of the efforts to exterminate mosquitoes in Saint Louis during the past eight years. Much has been done to fill up and drain stagnant pools and to prevent the formation of collections of water which might serve as breeding places. The greatest difficulty has been with the cisterns and tanks in the private houses, which through the incorrigible negligence of the native inhabitants often contain larvae. A system of inspection by a brigade has had good results, so much so that Saint Louis is the only large town of Senegal which has not been attacked by yellow fever in recent years.

C. M. W.

Bischoff. **Vernichtung der Wanzen in militärischen Gebäuden mittels Salforkose.** [The Destruction of Bugs in Military Quarters by Means of Salforkose.]—*Deut. Militärärzt. Zeits.* 1912. Sept. 20. Vol. 41. No. 18. pp. 681-694.

The paper describes a new substance for destroying bugs and other verminous insects. The preparation is a proprietary one devised by a chemist in Magdeburg and is named "Salforkose." Its composition is not given, but sulphur is evidently its most potent constituent. A special apparatus for developing the fumes is described. The price of this is 40 marks; a kilogram of "salforkose" costs 1·50 marks, a reduction being made if ordered in larger quantities. The apparatus and drug can be obtained from Albert Scholtz, Hamburg 6, Neuer Pferdemarkt 19. The author of the paper vouches for its efficacy in destroying bugs, lice, moths, fleas and other troublesome insects.

G. C. Low.

Rucker (W. C.). **The Bedbug.**—*U.S. Public Health Rep.* 1912. Nov. 15. Vol. 27. No. 46. pp. 1854-1856.

The author gives a brief account of the life history and habits of the common bedbug. As regards their destruction, this is difficult once they have found lodgment in a house. The first thing to do is to discover their place of concealment and to destroy it. For this purpose the paper may have to be taken from the walls, or if this is not practicable it should be thoroughly pasted down in the places where it has become loosened. Benzine and

kerosene may be injected behind wainscotings or applied to floor cracks. Oil of turpentine, corrosive sublimate, or boiling hot water may be used for the purpose of destroying both the adults and the eggs.

None of the insect powders are particularly effective. Fumigation by burning sulphur in the proportion of two pounds to the 1,000 cubic feet of air space, after closing all the cracks, is efficacious. The gas should be allowed to remain in the fumigated room for from four to five hours. Hydrocyanic acid gas is of course very efficient, but it is a dangerous and highly poisonous agent. One way to produce it is to place common commercial sulphuric acid in an ordinary granite or earthen vessel and then, after having made sure that there will be no further cause to enter the room, to drop into the acid a thick paper bag containing potassium cyanide. Quickly leave the room, close the door tightly, and seal up any cracks around it with paste and paper. Great caution should be used in entering the room again, and it must be thoroughly aired before occupation. This method of fumigation should be applied only by experts.

Of enemies the bedbug has two, the ordinary cockroach and the little red house ant, but it is questionable whether it is wise to introduce these insects into a house for the purpose of destroying the bugs.

G. C. L.

Blacklock (B.). **On the Resistance of *Cimex lectularius* to various Reagents, Powders, Liquids and Gases.**—*Ann. Trop. Med. & Parasit.* 1912. Dec. 30. Vol. 6. No. 4. pp. 415-428.

The habits, food supplies and life history of the bed-bug were first studied. Next, experiments were done with powders of many kinds, beginning with well-known proprietary and patent insecticides, and continuing with other powders of vegetable and mineral origin. Liquid preparations were then tested, and finally the action of certain gases.

The conclusions reached are summed up as follows:—

"1. *Cimex lectularius* whether in the larval or adult stage is not readily killed by depriving it of human blood.

"2. It may thus remain alive and active for months in houses which have ceased to be inhabited.

"3. Houses on being re-occupied after being empty for months may still be found infested with bugs.

"4. Bed-bugs may transmit certain diseases from one human being to another. Therefore, it is inadvisable that bugs and human beings should occupy the same house.

"5. Human beings must be protected from the attacks of bed-bugs.

"6. There is no evidence that bed-bugs can be cleared out of a house by insecticide powders. Experiment suggests that powders are of very limited utility.

"7. The same applies to liquid remedies.

"8. Gaseous substances present the best prospect of success.

"9. Of such substances, sulphur dioxide is cheap and effective.

"10. Sulphur dioxide gas under pressure for two minutes, kills with certainty all stages in the cycle of development of the bug, including the egg."

G. C. L.

Blacklock (B.). **The Resistance of *Ornithodorus moubata* to various Sheep-Dips.**—*Ann. Trop. Med. & Parasit.* 1912. Dec. Vol. 6. No. 4. pp. 429-433.

Various sheep-dips, such as Cooper's, Little's, Savar's, Hayward's Yellow Paste and MacDougall's dip, were used. Observations were made when the dip was still moist on the skin of the animal, and when it had dried. Frequently the ticks fed well, but sometimes they refused to feed under these conditions. As those ticks, which would not feed, refused usually to do so when placed on normal skin used as a control, their failure to feed can hardly be attributed to the prophylactic action of the applications, but should more probably be attributed to the condition of the ticks themselves.

As regards curative experiments the ticks were allowed to feed on the shaved skin of an animal, and while still feeding, the various dip solutions were applied to them at varying intervals after the commencement of the meal, the dips being poured into the feeding glass, completely covering over the parasites.

In other instances ticks were placed in test tubes and the dip solutions poured over them, care being taken that the parasites were completely covered by the solution, this being effected by means of a piece of blotting paper which prevented the ticks rising to the surface of the fluid.

Blacklock's conclusions are as follows:—

"1. The dips tested failed very frequently to prevent *Ornithodorus moubata* feeding on an animal.

"2. Feeding ticks were not easily caused to loosen their hold by them.

"3. In test tube experiments the resistance of this species of tick to these substances in solution is marked.

"4. Used in the strength recommended and for the time suggested these dips appear to have very slight effects on this tick.

"5. Possibly other ticks behave in a different manner under these applications."

G. C. L.

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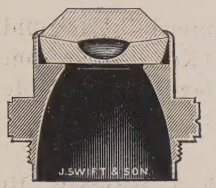

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CONTENTS.

BERIBERI.

	Page.
STRONG & CROWELL; VEDDER; SCHAUMANN: Etiology of Beriberi	477–479
COOPER: Properties of Certain Foodstuffs used against Polyneuritis in Birds	480
FUNK: The Nitrogenous Constituents of Lime-Juice ...	482
FUNK: Action of Purine- and Pyrimidine-Derivatives in Neuritis of Birds	483
GLOGNER: The Food Theory of Beriberi	483
LOVELACE: Beriberi in Brazil	484
VEDDER: Beriberi on Board Ship	484
CREEL; WELLMAN, BASS, & EUSTIS; SWAN: Beriberi in the U.S.A.; Louisiana Rice	485
SMITH & HASTINGS: Multiple Neuritis in Soldiers in Calcutta	486
MCLAUGHLIN: Beriberi in Infants...	486
CHEVALLIER: Beriberi in British East Africa	487

MALARIA.

VON EZDORF: Malaria in Alabama	488
KENRICK: Malaria in India and the Birth- and Death-Rate...	488
ARENA: Cerebellar Symptoms in Malaria...	488
KAUFMAN: Apoplectic Malaria	489
RYAN: Malaria complicating Pregnancy	489
LAVINDER; ZIEMANN; JOUKOFF: Cultivation of Malarial Parasite	489–490
CRESPIN & BEGUET: Haemolysis in Malaria	491
MANOILOFF: Anaphylaxis in Rabbit and Guinea-pig induced by Salts of Quinine	491
FACCIOLA: On a Coccus found in Malarial Patients ...	492
RUGE: Malaria (Review)	492

BLACKWATER FEVER.

GRAHAM: Blackwater Fever in Southern Nigeria ...	493
BALFOUR: A Case showing Leishman's Cell Inclusions...	494
WERNER: Cholesterin and Glycerin in Blackwater Fever	494
YOFÉ: Prophylaxis of Blackwater Fever	494

PROTOZOOLOGY.

ALEXEIEFF: Parasitic Specificity; Questions of Synonymy in the Protozoa	496
NÖLLER: The Blood Protista of the Frog and their Transmission	497
CHATTON: Some Leptomonas of Muscidae	498–499
ASHWORTH & RETTIE: A Gregarine of Bird Fleas ...	499
MARULLAZ & ROUDSKY: *Haemogregarina terzii* ...	500
FRANÇA: Haemogregarines of Lizards	500
FANTHAM & PORTER: Myxosporidia in the Gall Bladder of Fishes	501

SLEEPING SICKNESS.

ROBERTSON: The Life History of *Trypanosoma gambiense*	502
ROUBAUD: Bio-geographical Relation of Tsetse and Trypanosomes	503
FISCHER: *Glossina morsitans* as Transmitter of Sleeping Sickness on the Victoria Lake	505

SLEEPING SICKNESS—*continued.* Page.

ROSS : Infection of Monkeys by the Bite of *Glossina longipennis* 505
MARTIN & DARRÉ : Human Trypanosomiasis contracted in the Laboratory 506
RANKEN : Sleeping Sickness in the Lado Enclave ... 507
RIQUIER : '606' in *T. brucei* and *T. equiperdum* Infections 509
SALMON : Acridine in Treatment 510
NOVY, PERKINS, & CHAMBERS : Immunisation by means of Cultures of *T. lewisi* 510
LAVERAN : Attempts to Immunise against Pathogenic Trypanosomes 512
TAUTE : The Human Trypanosome of the Rovuma River District 513
WERNER : A Case of Human Trypanosomiasis from Portuguese East Africa 514
BEVAN & MILLINGTON : The Human Trypanosomiasis of Rhodesia and Nyasaland 515
KINGHORN & YORKE : The Trypanosomes of Game and Stock in Northern Rhodesia 516
RODHAIN, PONS, VANDENBRANDEN, & BEQUAERT : Animal Trypanosomiases in the Upper Katanga ... 517
LEGER : A Focus of Sleeping Sickness near Bamako ... 518
RINGENBACH : Sleeping Sickness between Loango and Brazzaville 518
FLEMING : Trypanosomiasis in Southern Rhodesia ... 519
DIAS ; GUERREIRO ; BLANCHARD : American Human Trypanosomiasis 519–521
LAVERAN & MESNIL : Trypanosomes and Trypanosomiases (Review) 522
NUTTALL : Herter Lecture 522
NEWSTEAD : *Glossina austeni* 523
BOYCOTT & PRICE-JONES : Anaemia in Nagana of Rabbits 523
NATTAN-LARRIER : Action of Bile on Trypanosomes ... 525
OEHLER : Pure Strains obtained by Transmission of Single Trypanosomes 525
BELTZER, KOHL-YAKIMOFF, & YAKIMOFF : *T. equiperdum* in Russia-in-Europe 526
BIOT & RICHARD : Infection of Jerboa and Dormouse with *T. lewisi* 526
ROUDSKY : Morphology of *T. lewisi* under Abnormal Conditions 527

YAWS.

KERR : Yaws and Gangosa in Guam 528
DEGORCE : Papular Roseola in Yaws 528
HARPER ; KOCH ; MOUCHET & DUBOIS : Treatment of Yaws by Salvarsan 528–530
BROCHARD : Salvarsan by the Mouth in Yaws 530

DESTRUCTION OF BITING ARTHROPODS AND TICKS.

BOURRET ; LEGENDRE : Destruction of Mosquitoes by Quinoline 531
BOUET & ROUBAUD : Destruction of Mosquitoes by Crésyl 531
THIROUX : Destruction of Mosquitoes by Tobacco ... 532
D'ANFREVILLE : Anti-Mosquito Measures at St. Louis ... 533
BISCHOFF ; RUCKER ; BLACKLOCK : Destruction of Bed-Bugs 533–534
BLACKLOCK : *Ornithodorous moubata* and Sheep-Dips ... 535

The next Number will be issued on April 15th.